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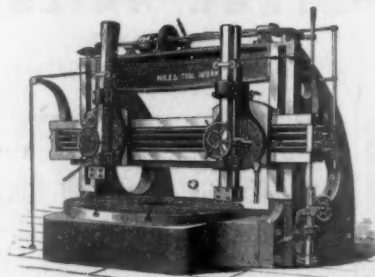
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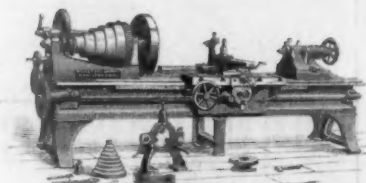
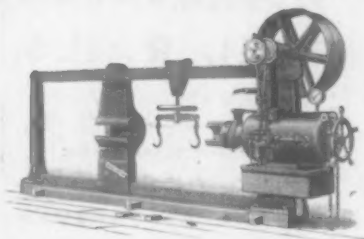
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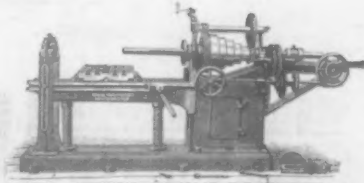
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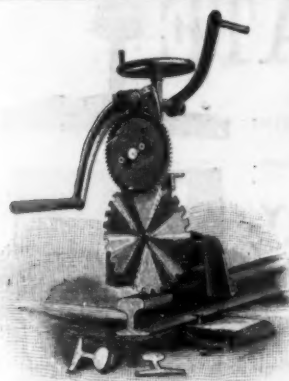
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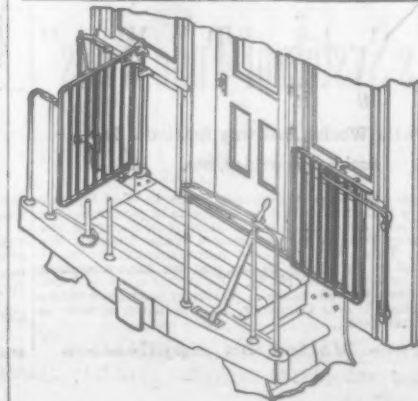
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Cambria Iron Co., Johnstown, Pa.
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Solid Steel Co., Alliance, O.
Pratt & Litchworth, Buffalo, N. Y.
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Schoen Mfg. Co., Pittsburgh, Pa.
Steel and Iron Plates
Lukens Iron & Steel Co., Coatesville, Pa.
Steel and Steel Tires
Midvale Steel Co., Nicetown, Phila.
Lullier Steel Works, Latrobe, Pa.
Thos. Frower & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.
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New Jersey Car Storage & Repair Co., Lake View, N. J.
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Allentown Rolling Mils., Allentown, Pa.
Kilbitt Frog & Switch Co., St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Johnston, R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
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Union Switch & Sig. Co., Pittsburgh, Pa.
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Manning, Maxwell & Moore, 111 Lib. St., N. Y.
D. Saunders' Sons, Yonkers, N. Y.
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Fitts, Testing Laboratory Pittsburgh, Pa.
Telegraph Cable-Bolt System
Electric Secret Service Co., N. Y. City.
Gill-Alexander Electric Mfg. Co., Kansas City, Mo.
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G. & C. Co., Chicago.
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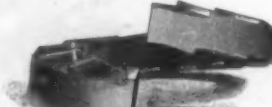
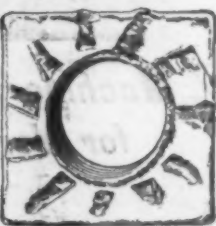
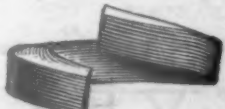
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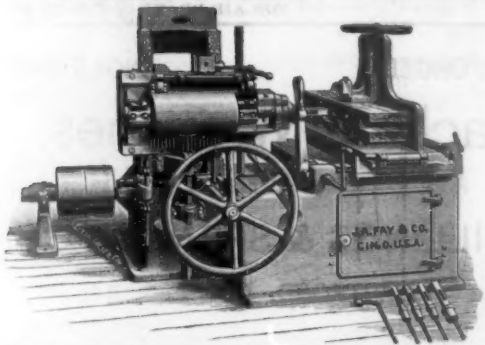
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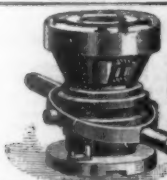
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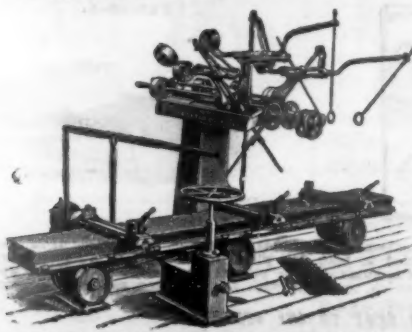
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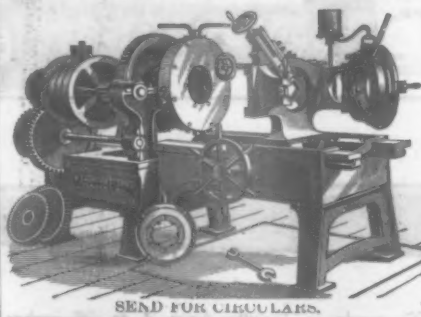
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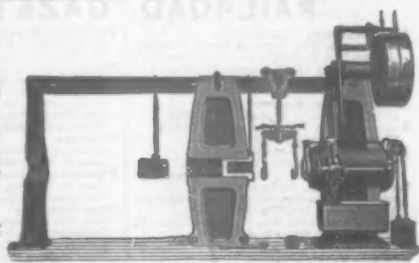
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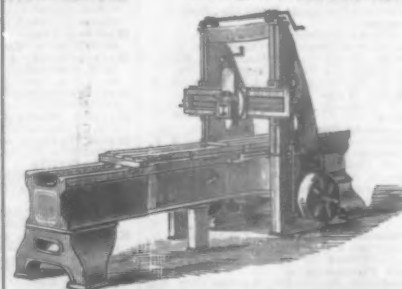
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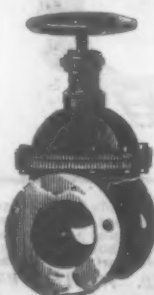
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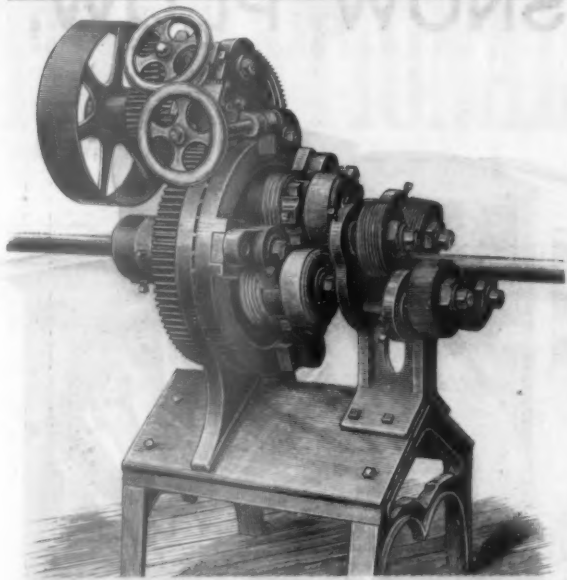
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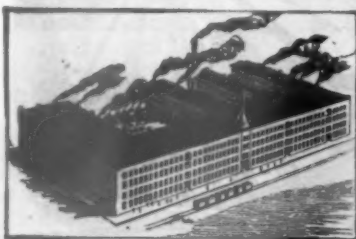
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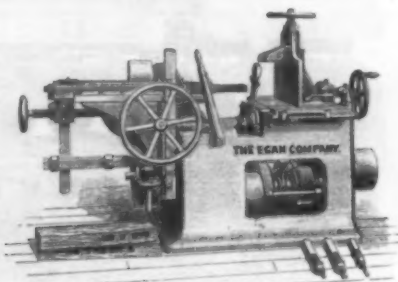
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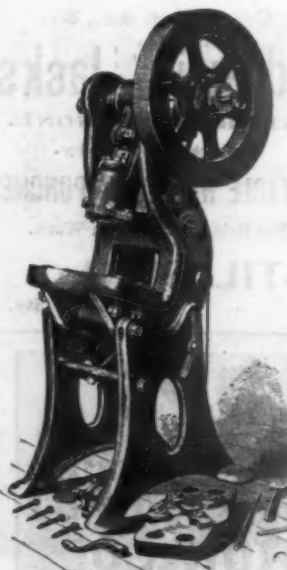


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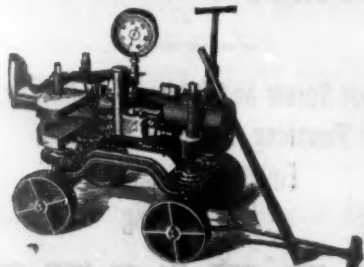
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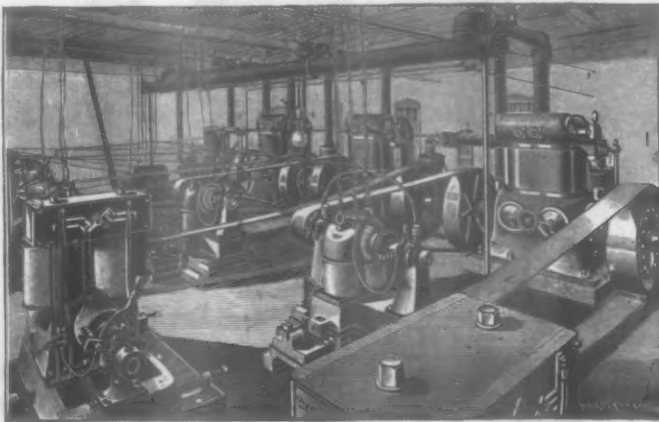
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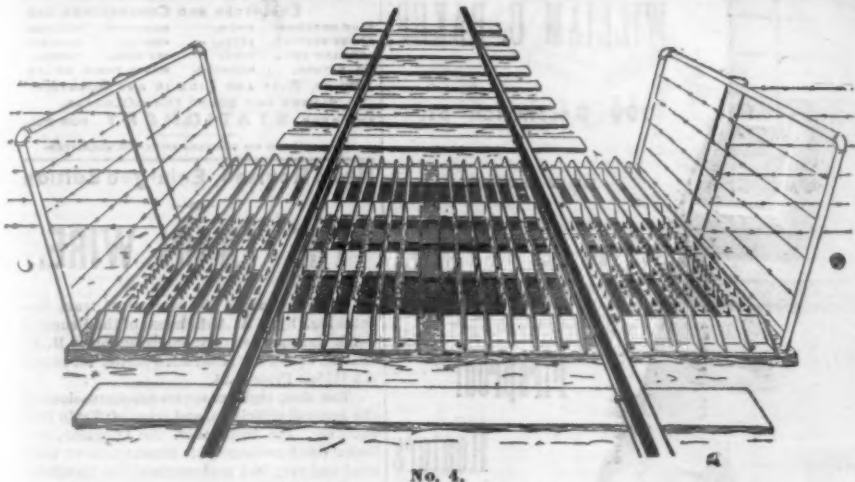
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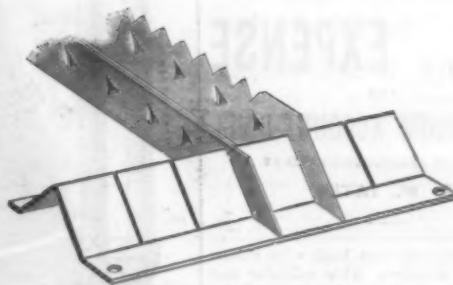
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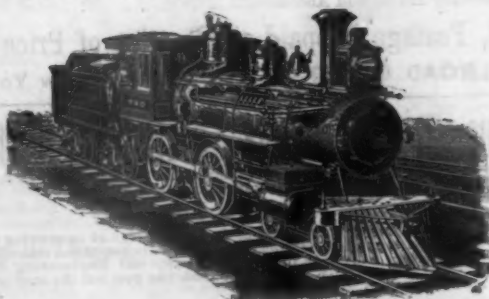
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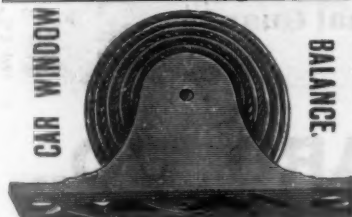


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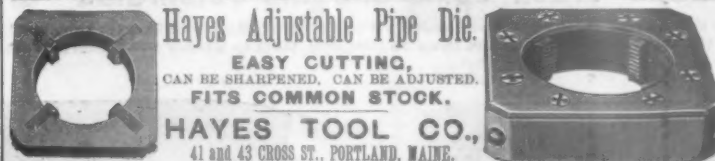
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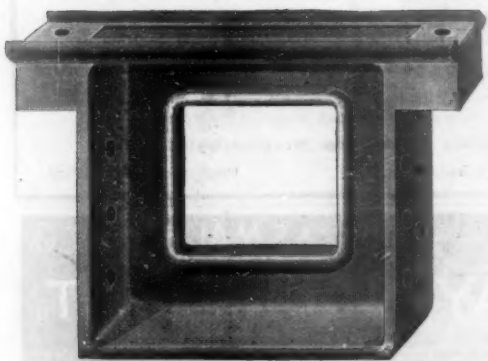
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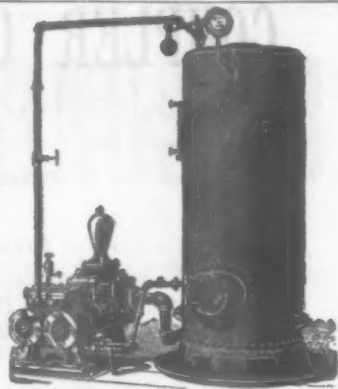


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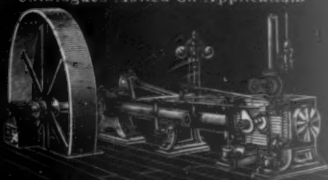


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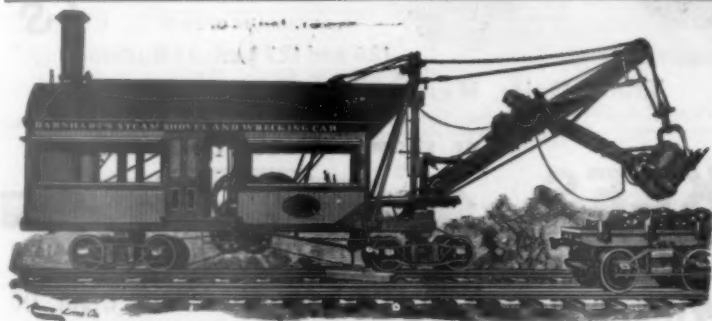
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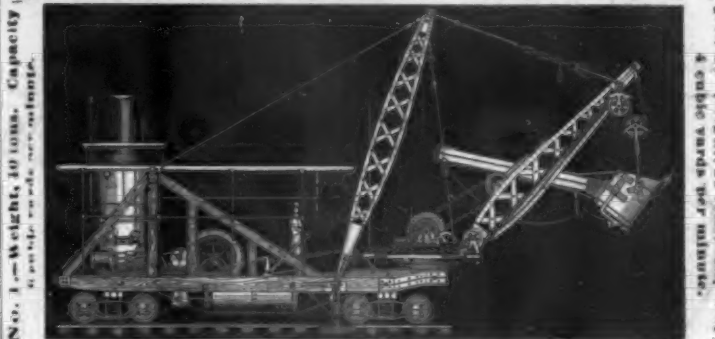
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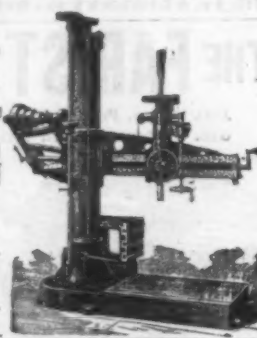
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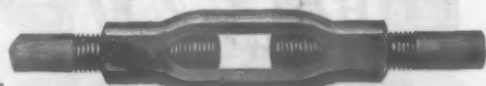
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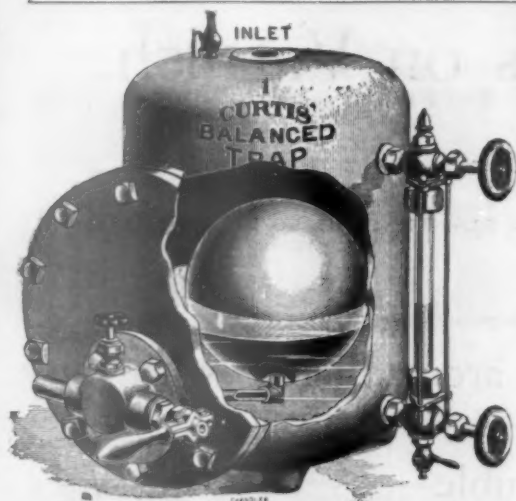
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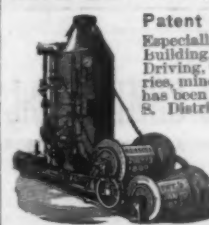
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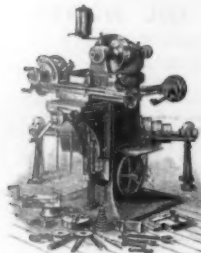
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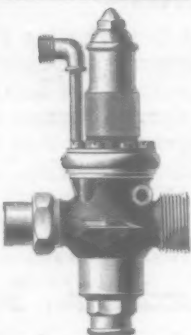
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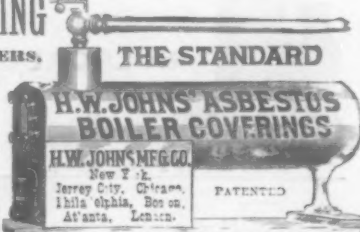
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FRIDAY, FEB. 26.

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Contributions.

Another Word on Tie Plates.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read with a good deal of interest what Mr. Reece said last week about tie plates, and your editorial on the same subject. It is all good so far as it goes. Mr. Reece's theory and facts are useful to any one who cares to look into this subject, as every maintenance of way man ought to; but it strikes me that his statement is *ex parte*. I should like to know something of the experience with other than channel plates.

For instance, in your 1890 volume, p. 309, you show a plate tried on the Pennsylvania which I think has some great advantages over the Servis plate. It gives the rail an inward cant and takes up the thrust by this cant and by a clip, instead of depending on the spikes alone. It will hold the rail and plate tightly together and has provision to take up wear and keep them tight. It has also about 80 sq. in. of bearing surface on the tie, or more than twice as much as the widest Servis plate. Still further it can be made in malleable iron.

In the same volume you showed the "Shoulder" tie plate with a shoulder punched up to take the thrust. I should like to know if this has shown weakness by buckling, and if it has not really protected the tie better than the Servis, which separates the fibres, and gives a lodgment for water. On your own authority it must have been used over two years now under very heavy tonnage, and on a number of roads. There ought to be some facts available now to show how useful it is.

Again, consulting still that remarkable encyclopedia of railroad knowledge, the files of the *Railroad Gazette*, I find in 1889, pp. 221 and 608, two designs by that distinguished and practical trackman, C. P. Sandberg, which strike me as very mechanical and simple. What has been the actual experience with them? I do not want to be responsible for placing a large order for tie plates until I know more than I can learn from Mr. Reece's article about these other designs.

MAINTENANCE.

Extension Smokebox on a Compound Locomotive.

PITTSBURG, Feb. 18, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There can be no doubt that you correctly state the Vaucalin compound for fast passenger service which you show in the *Railroad Gazette* of Feb. 12, to be one of the most interesting engines you have illustrated, and for this reason inquiries, through your columns, for further information as to any of its features, will not, I presume, be considered inappropriate either by yourself or by the builders.

Without desiring to advance any position or enter upon any discussion, I would like, as a seeker after truth, to be informed why an extension, apparently about 42 in. in length, has been added to the smokebox of the engine, and ask the question particularly in view of the fact that the engine is a compound, of a type for which it has been claimed (and in my opinion correctly) that practically no solid matter is drawn into the smokebox, by reason of the very light exhaust.

So far as I have been able to understand the position of those who advocate an extended smokebox, its purpose is, primarily, to afford sufficient area of netting to arrest sparks, and, secondarily, to act as a cinder receptacle. Neither of these functions would appear to be necessary in this engine, which I think could be run satisfactorily without any netting, or if not, an ample area of netting could be placed in a smokebox of 60 in. diameter projecting not over 12 ins. in front of saddle. On the other hand, the addition of the extension in-

volves an increase of cost, and weight upon the truck, which I do not understand to be either necessary or desirable; renders the front end less conveniently accessible; and, to my mind, seriously mars the otherwise symmetrical proportions of the engine, although this, of course, is merely a matter of taste.

With a firebox of insufficient size, overworked, with a sharp exhaust, it may not be difficult to discover the reason for the use of an extension, but in this case none of these conditions are present. Why, therefore, should a supposed remedy be provided for evils which do not exist; or to put it in another way, why should a locomotive be saddled with an appendage which its development has outgrown?

J. SNOWDEN BELL.

Smoke Prevention.

NEW YORK, Jan. 11, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your article on "Smoke Prevention in Large Cities," in the issue of the *Railroad Gazette* of Jan. 8 is a little contradictory in its treatment of the subject, inasmuch as it condemns most of the appliances offered for this purpose as worthless and affirms that to accomplish the desired result an improvement must be made in the boiler settings and to this must be added an increase in the wages of the firemen, and declares that "There is no other way out of it." Then follows the assertion that "The use of patent appliances may in some cases be desirable, as by an intelligent use of them, smoke can be reduced in a plant which is badly constructed." If the use of an appliance will reduce the formation of smoke in a badly constructed furnace, why may it not entirely prevent it in a moderately well constructed one? [This does not follow.—EDITOR.] If it can, and I know from experience that it can do so, then there is another way out of it without resetting the boilers, and that expense is avoided however desirable it may be to increase the wages of the firemen.

When the smoke abatement act was passed in England a similar discussion to that which is now looming up in Chicago took place. I well remember a case in which the proposition to bring in air over the fire met with the most decided opposition. The construction of all ordinary furnaces was appealed to. Did not all fire grates take air beneath the bars? Could a blacksmith's fire be made by blowing air over the top of the coals? It is surprising that the same arguments may be heard to-day among those who should know better.

I can testify to the utility of some smoke preventing devices as applied both to stationary and locomotive furnaces, and have seen volumes of smoke pouring out of the smokestack, cut off as if with a knife upon opening a single faucet that caused air to be applied in the proper place. These devices are simple and easily applied without subjecting steam users to the annoyance and loss of pulling the furnace to pieces. Upon locomotives they are equally efficacious, always providing they are properly constructed and intelligently used.

In your article it is further laid down that "The best and cheapest way to get a non-smoking locomotive is to use coke fuel." This may be the best way because there is absolutely no smoke from coke, but if it is the cheapest then the conditions are very different in this country from what they were in England. The London & North-western Ry. at one time used nothing but coke on their locomotives and an exhaustive series of experiments were undertaken in order to ascertain the comparative cost of coke and coal. The results were largely in favor of coal and notwithstanding that they had to adopt devices for the prevention of smoke, the change was made and bituminous coal became the fuel for their locomotives. I have no doubt the C. & B. & Q., which you say have taken this method of preventing smoke, will find it the best way, but certainly not the cheapest unless they can get their supply of coke at very low rates.

One more point and that is in reference to the economy of smoke preventing devices. Upon this point your article makes a decided statement that "It is popularly supposed that to prevent smoke is to make a saving in the cost of fuel, but, generally speaking, this is not true. It will cost more to prevent a boiler plant from smoking than the fuel saved will amount to." If we can render combustion so perfect by the use of a device that no smoke is formed there ought to be a corresponding saving. Careful tests have been made to ascertain what this saving is. I have not the figures by me, but I recollect that on the North of Scotland Railway this saving was found to be 18 per cent. On other lines this percentage was not reached, but a general average gave about 9 per cent.

JAMES HOWARD.

[Our correspondent apparently has not fully comprehended what we said about devices for the prevention of smoke. What was said is, in brief, that the admission of air above the fire is practiced in the best modern steam plants, and this is done to reduce smoke. Also that few of the smoke preventing inventions are of any practical value and none are automatic in action; and further, that it requires a better and more intelligent fireman (hence a higher priced one) to run a boiler without smoke even when supplied with the best known appliances for its prevention. Now, if there is anything wrong about these statements, we must acknowledge our inability to see in what manner our correspondent has shown it to be so by

his assertions of what he has seen, but which he has not illustrated by a definite statement of facts and description of devices. The burden of proof is on those who say that any of the so-called "smoke preventing" devices save coal, and in the hands of the average fireman on a locomotive burning bituminous coal will result in a white exhaust from the stack at all times. Let us have facts. With regard to our correspondent's English citations, we refer him to an editorial in *The Engineer*, Jan. 8, on this subject, and for an opinion as to fuel saving he may consult Mr. Metcalf's paper in this issue.—EDITOR RAILROAD GAZETTE.]

The Reading Leases.

NEW YORK, Feb. 24, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I can but agree with the general conclusion advanced in your excellent editorial last week on the Reading leases; yet there are minor matters affected by so great a change, which your readers may like to see mentioned.

First, about the Lehigh Valley dividend. It is an open secret that this company is not now earning its five per cent. dividend easily. It has been taking upon itself heavy obligations to finish its Buffalo line and its New York terminals, neither of these works as yet being utilized so as to yield a revenue. Indeed, it is said that the fact of such heavy borrowing was taken advantage of by the Reading party to force the Lehigh Valley to enter the combination or suffer large financial loss. Not only will the Lehigh Valley be in easier financial position when its through lines are finished at both ends, but the Reading's westbound coal, now sent to Buffalo via the Fall Brook and New York Central, will no doubt be added to the Lehigh Valley's own tonnage. The present rate of \$1.70 per ton on hard coal from the mines to tide-water over a cent per ton-mile is so profitable that with the same tonnage an increased dividend can be earned when the Buffalo and New York extensions are in regular use.

How to keep the same tonnage for all the combined roads will prove a difficult problem. To keep the tide-water price at \$4 (to say nothing of such a further advance as would increase the retail price to consumers) necessarily means a limitation of the supply to the known demand. This in turn means restriction in the mining, a thing hitherto impossible. One-fourth of the total output is mined by individual operators who are independent of the great companies. These must be reckoned with, for they could break down the market at a time of restriction unless placated. Then restriction would also mean less tonnage to carry, though in the long run a fair price at tidewater would be better for all concerned. But low selling prices and highly profitable railroad tolls are antagonistic and one or the other must in the end be changed. The latter also invite outside competition, like that of the New York, Ontario & Western and New York, Susquehanna & Western.

The extent of the abuses in the coal trade is scarcely appreciated by the public. The practice of selling coal on a commission per ton paid to outside sales agents invites demoralization. The writer is informed of one coal contract which provides that the mining company shall sell to its agents its coal at \$3.50 per ton so long as coal sells at more than that price, but shall reduce the price whenever the market quotations drop below \$3.50—a sort of "heads I win, tails you lose" arrangement for the sales agents. A reform of these selling matters upon a business basis is among the possibilities under the combination, with a resulting saving to the companies, but no advance in the retail price.

The trunk line competition of the Lehigh Valley and the Lackawanna for through grain merchandise and immigrants can now be more easily regulated, and in so far the New York Central and the Pennsylvania will be benefited. But another problem is likely to arise. As the *Railroad Gazette* has shown, the matter of profit to the Reading out of the coal traffic is doubtful, but with a good line to Buffalo of its own, it may become a necessity for the Reading to earn more from the carriage of other things than coal. As the real success of the Reading under its guarantees may depend upon this additional traffic, it is not impossible that the future may find the Reading an active competitor of the Pennsylvania for the west and east bound traffic throughout the region from New York City to the middle of Pennsylvania, including Philadelphia. It is not the carriage of hard coal alone which is likely to draw out the opposition of the powerful Pennsylvania Railroad.

The people of Pennsylvania have every reason, so far, to acquiesce in the "deal." It can hardly mean any damage to Pennsylvania interests (except perhaps the Pennsylvania Railroad) and may mean much good. It is well to remember this fact in any estimate about the illegality of the leases, for it may turn out to be more of a commercial than a legal question. Generally speaking, the Reading and the Lehigh Valley do not compete for the carriage of the same coal. The fact that two roads carry competitive products has not yet been assumed to be a bar to consolidation—all roads are competitive in that sense. The Reading leases the Lehigh Valley, and the Port Reading leases the New Jersey Central, which in turn leases the Lehigh & Susquehanna. This latter road runs parallel to the Lehigh Valley for a hundred miles in Pennsylvania, but it seems a long legal way around through these various leases.

Should any oil by chance be unburned and travel so far as the brick arch, and even run down it, it cannot live and travel over the firebrick protection of the lower tube plate without vaporization and combustion, hence this protection, which is the one slight difference observable from common practice, a difference, however, of no importance or injury to the engine's coal burning properties.

There is no projection of any oil upon the firebox sides, neither is there any local intense combustion as exists in such systems as vaporize the oil before igniting, and thereby produce local plate wasting. On the contrary, the whole interior of the firebox is filled with flame, and no special ignition point, or, rather, combustion area, is apparent. Heating is, therefore, general, and temperature even.

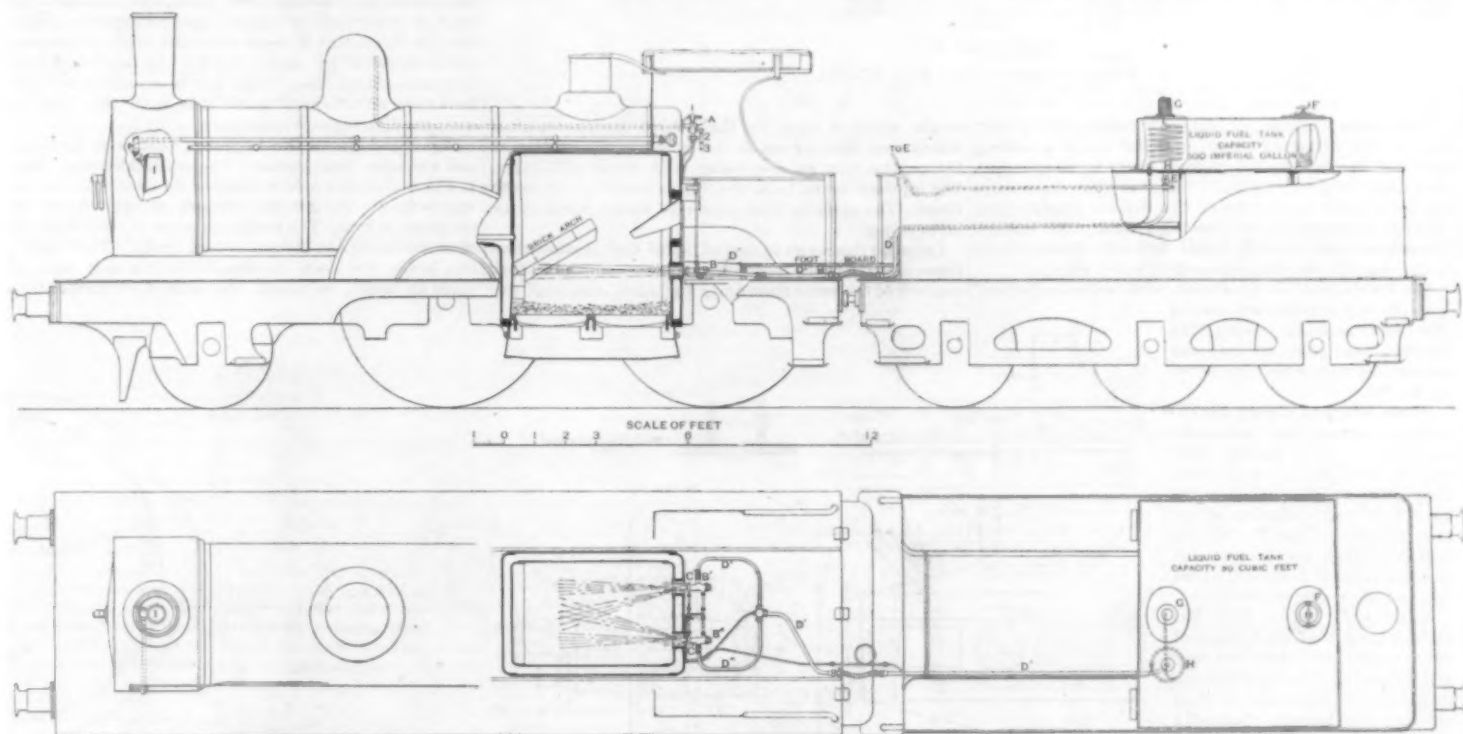
Though, nominally, a pound of oil has not, I believe, the steam-making power of two pounds of coal, nor perhaps could it be shown to have in a prolonged test, yet in practice one pound of oil is found to be about equal to double the quantity of coal, owing to the facility of regu-

shovel to keep up the thin fuel bed on the grate, and in attention to the oil apparatus at the slow-ups to prevent the waste of steam at the safety valve. All mechanical apparatus falls short of absolute perfection, but certainly it is scarcely fair to use any other descriptive term of the manner in which the apparatus worked throughout. There was no hitch whatever. The ash pan damper worked all the way at about middle notch, which means about $\frac{1}{2}$ opening. As the steam to the two oil injectors is equal in amount by construction, the oil supply is regulated by the hand wheels, and the best way of doing this is by the chimney top. Oil in excess on either side will darken the exhaust on that side of the funnel, and can then be shut off a little until the smoke disappears, while smoke on both sides means more air is required, and this is given by increasing the ring jets. Mr. Bell of the locomotive department, informed me that about 120 lbs. of chalk lump is put on the grate for lighting up, and it would seem that this quantity could be increased and the fire bed worked to a very considerable degree of what would be called dirtiness if not for the daily lighting

issuing jet of oil, and both spread it and mix it with air and diffuse the flame throughout the firebox, so preventing local heating.

While the name of "*petrolia*" indicates the sort of refuse Mr. Holden would like to obtain, the liquid at present used consists of mixtures of common gas tar, oil gas tar and creosote oils. On the run of Dec. 12 we had half coal tar and half creosote residuals. The above fuel average per month includes, of course, the working of the Westinghouse brake and also the automatic vacuum brake; the latter, however, being exhausted continuously by the central air inlet of the air injector by the hose connection already referred to.

The injector, entirely of gun metal, is clearly shown in section in accompanying drawings. Oil enters at the side some way back of the steam nozzle and outside this. Steam, therefore, comes inside a thin ring of oil at the mixing nozzle and through the inner tube comes the vacuum brake air which, expanding as it becomes heated, still further aids the breaking up of the oil into spray. The ring jets of steam induce a further supply



APPARATUS FOR BURNING LIQUID FUEL ON THE GREAT EASTERN RAILWAY—ENGLAND.

4. Steam fitting with four cocks:
 1. Steam to warmer in fuel tank.
 2. Steam to rings on injectors.
 3. Steam to jets in centre of injectors.
 4. Steam to clear fuel pipes and injectors.

- B' B."* Liquid fuel injectors.
C' C." Liquid fuel regulating valves.
D' D' D." Liquid fuel pipes with cock at *E*.
F. Manhole with filling hole.

- G.* Air inlet.
H. Warming coil.
I. Patent variable blast pipe.

lation and the saving at the safety valve and of the back pressure from reduced blast pipe resistance. All these points are favorable to the oil, which has the further advantage of cleanliness and greatly reduced labor all round, for it makes no unconsumable refuse, requires no stoking beyond the keeping up of the small bed of coal fire, which seems to have such an advantage over any system of oil burning which rejects coal entirely.

In the ordinary work of the Great Eastern Railways the run between London and Cambridge—about 56 miles—will be made with one firebox full of fuel made up ready for the run and untouched. This will bring the train to its destination, and if it were known that the engine would be shedded at once the steam might be pretty well reduced and the fire left to finish nearly dead. Right here comes in the advantage of liquid fuel. Even if steam be down and the fire nearly out, the turning of a handle or two will put the engine in readiness to take out any train in five minutes after notice, and thus an engine may be worked to the economy it would be if about to be shedded, and yet be ready for a full-power run almost instantly. As the fireman remarked, "She will keep steam as far as Doncaster without an effort, and then be just as fit to run a further 200 miles as when we started."


The accompanying illustrations were supplied to me by the Locomotive Superintendent of the line, Mr. Holden, whose patent this apparatus is, and by his kindness I was enabled to make a run with the engine on Dec. 12 when No. 760 took down the 4:32 p. m. Doncaster express to Cambridge, starting out from Liverpool street with a train of 17 vehicles weighing, exclusive of engine and tender, 537,000 lbs., or 240 English tons (269 American tons). The total train weight was thus 704,506 lbs., but six vehicles were slipped at Bronbourn and the remainder of the journey made with 11 only. The run to Cambridge was made in 73 minutes, including the slow up for Bronbourn slip and several signal blocks, none of which, however, involved actual stoppage.

The fireman's work consisted in a very little use of the

Elevation of Foot-Plate.

Macallan's Variable Blast Nozzle.

Macallan's Vari
Nozzle.



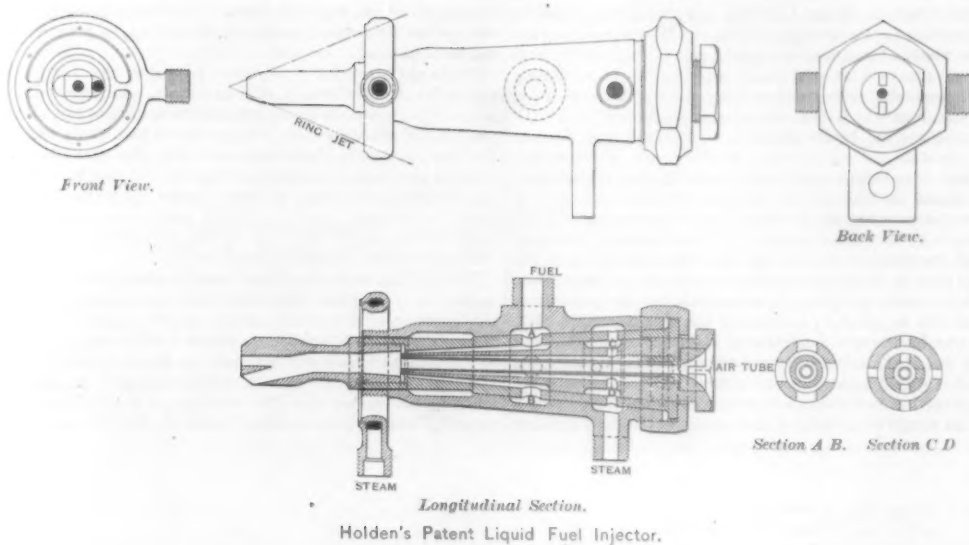
Elevation of Foot-Plate.

Mr. Holden informs me that his early experiments convinced him that, for oil burning to be a success, the apparatus for the purpose must be independent of any firebox alteration, or, indeed, of anything which would prevent *instant return* to coal or solid fuel, or its use in lighting up. Hence his special injector to break up the oil into fine spray, without the use of brickwork, hitherto common as a means of giving an extended surface of exposure to the oil. This breaking up of the oil is enhanced by the several small ring jets which converge on the

of air on the exterior of all, and so is obtained an alternation of air, oil, and air, which promotes admixture and thorough combustion. The whole inside of the injector is removable and can be replaced with a spare set in a few minutes, when running. Removal of the brake hose connection allows the injector nozzle to be cleared by a wire while it is actually at work, this being the main reason of this through passage which has been utilized, also for the purposes of the vacuum brake. As the engines of the Great Eastern Company are the first express engines to burn liquid fuel, the general dimensions will perhaps be of interest. They are as follows:

Cylinders.....	diameter.....	1 ft.	6 in.
Boiler, diameter outside.....	stroke.....	2 "	4 "
" length of tubes (steel).....	"	19 "	4 "
" diameter of tubes.....	"	0 "	1 3/4 "
" number " " 256.....	"		
Firebox, length.....	"	5 "	35 1/2 "
" breadth.....	"	3 "	14 1/2 "
" height.....	"	5 "	7 3/4 "
Grate surface, 17.9 sq. ft.			
Leading wheels.....	"	4 "	0 "
Driving.....	"	2 "	0 "
Coupled trailers.....	"	7 "	0 "
Wheel base.....	"	16 "	6 "
Weight on leading wheels.....			32,312 lbs.

drivers.....	31,472
trailers.....	30,324
Total.....	94,108 lbs., or 47 tons.
Weight of tender.....	72,500 lbs. in working order.
Capacity.....	2,640 gals. (English or 10 lb. galls.)
oil.....	500 "
coal.....	4,500 lbs.
Steam pressure.....	140 "
ports.....	1 3/4 in. x 15 in.
lap.....	3/4 in.
Valve travel.....	3/4 in.
Blast nozzle, 5/8 in. in diameter, reducible to 5 in. for coal burning when required.	
Specific gravity of liquid fuel, 1.09 to 1.11, according to mix- ture.	
Minimum gradient, 1 in 70 at Bethnal Green.	
Weight of train to Brounbourne, exclusive of engine and tender.....	337,690 lbs.
Weight of train, total.....	704,568 "
" after Brounbourne, exclusive of en- gine and tender.....	358,400 "
Weight of train, total.....	923,968 "
" heavy excursion trains worked on G. E. Ry. by No. 780 during past season, train only, 406,400 lbs. total.....	973,368 "



The engine is one of Mr. Holden's design, built a year ago at the Stratford shops, and has screw reversing gear and Stephenson link motion with inside cylinders and single leading wheels; in fact, it is what Americans are accustomed to consider as the definite English type of coupled engine for fast passenger work. Mr. Holden has other engines exactly similar but with single drivers—the rear drivers being replaced by small wheels.

The drawings of the apparatus, with reference letters, are fully self explanatory, almost the only omission being the vacuum hose pipes to the rear of the injectors which are fitted on No. 760.

In the summer, during the excursion season, the passenger work of the Great Eastern Railway is very heavy, and trains frequently weigh as much as 300 tons (2,240 lbs.), exclusive of engine and tender, and No. 760 has regularly taken her turn at this and the general traffic with perfect and unvarying satisfaction.

It certainly seems that Mr. Holden has solved the liquid fuel problem for locomotives in a very satisfactory and practical manner on the lines of no alteration of an ordinary coal burner. Indeed, I should anticipate from what I have seen of the working that there would be no difficulty in its application to the longest boxes of even American locomotives or

single wheel is used for the station stoppages, after which each injector can be set going again exactly as before, the stop so dispensing with fresh regulation. The injector steam, to be dry, comes from high up in the dome. The variable blast nozzle is shown open as for oil burning.

I give no figures as to cost of liquid fuel further than those relative to the monthly average of this and other engines of the same class doing the same range of du-

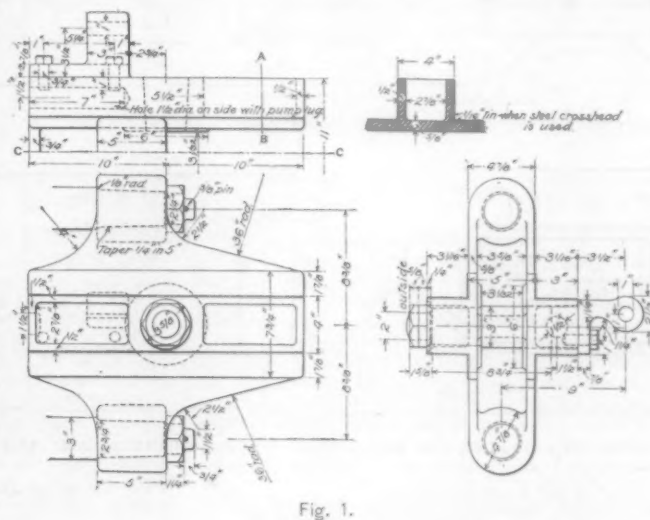


Fig. 1.

Fig. 2.

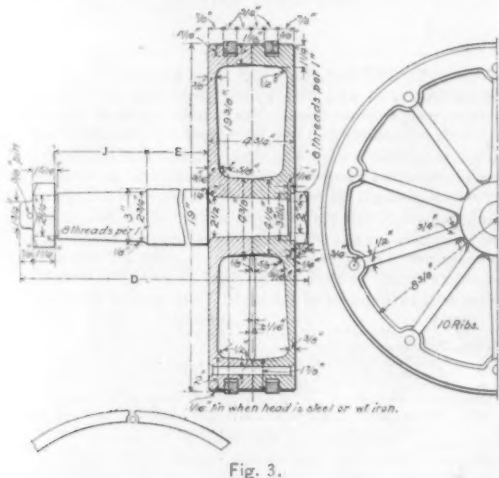


Fig. 3.

Light Crossheads and Pistons by the Baldwin Locomotive Works.

to the shallow boxes of hard coal engines. When applied on a South American railway the supply of oil was advanced in price as soon as it became known that the engines had been altered to burn oil. The oil producers did not know that the engines had not been so altered as not to burn coal, and were brought to realize their mistake when coal was promptly resumed, and oil soon fell back to a fair price again.

It should be added that the brackets V V of the oil regulating valves are movable vertically, though this is not shown in the accompanying figures, being a later addition. The two brackets are connected with a small hand wheel common to them both and a single movement of this drops both brackets and shuts both oil valves and again opens them exactly as before. This

ties, but these figures will be sufficient for any one to work out the cost for themselves in any locality by comparing the prices of coal and oil, liquid fuel being equal to about double its weight of good English coal, as shown by the record of No. 760. Perhaps petroleum refuse may be better than tar and tar oils, but I believe, speaking generally, there is not a serious difference as fuel between any of the very numerous products which will come under the head of liquid fuel, though chemically their shades of variation are infinite.

When liquid fuel has been and is employed in locomotive work, the absence of a bed of incandescent fuel on the grate is a cause of very serious temperature range in the firebox when the oil is shut off at stops. Where a solid fire is maintained on what may be termed the combined system, there is always a self incandescent fire to prevent undue cooling when the oil is stopped, and this appears in itself alone a valuable feature in the system quite apart from the question of lighting up in the ordinary way and the power of using all solid fuel if necessary at any time to do so.

I append a profile of the London to Cambridge section and an enlarged section of the blast nozzle, which is the patent of Mr. Macallan, also of the Great Eastern Railway.

Recent Designs of Light Crossheads and Pistons.

We have referred several times in the past to important changes that have been made in the designs of locomotive crossheads and pistons by the Baldwin Locomotive Works, and take pleasure in presenting these designs to our readers, believing that they are a step in advance which will reduce the difficulties of counterbalancing locomotives. About a year ago we gave at some length the different elements of counterbalancing, showing the comparative weights of reciprocating parts in this country and in Europe, and showing also the advantages of a reduction in the weights. Following is a description of the cuts, figs. 1 to 3, which represent the new designs:

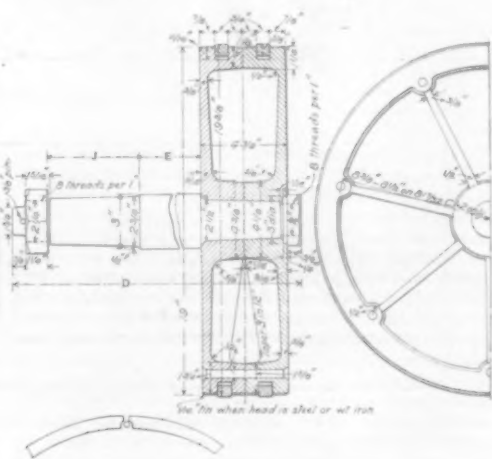
Fig. 1 shows a cast steel crosshead suitable for use

with the Vaucain compound. The same design has been made in wrought iron, with the difference that, instead of the cored recesses at the side of the crosshead, there were round holes drilled through the centres of the wings. The pump lug shown on this crosshead is only used when pumps are called for with the engines.

Those who are familiar with the first crossheads used on the Vaucain engines know that the guides were separated about 20 in., one above the other. In this design they are only 4 in. apart, which gives a decided increase in rigidity. An important improvement in this design is the use of a tinned surface instead of a brass liner where the crosshead bears against the guides. When brass liners are used, they do not add to the strength of the head, but increase the weight considerably. In this design practically all the material in the crosshead adds to its strength, and the bearing surface is obtained by adding $\frac{1}{8}$ in. of tinned surface where the crosshead bears against the guides.

This crosshead weighs when made of cast steel 200 lbs., and serves for two cylinders, while the ordinary Laird crosshead for one 19-in. cylinder weighs 230 lbs. Here, then, is a saving, even when two cylinders are used, of 30 per cent. in weight. One noticeable improvement in this design is the attachment of the piston rods to the crosshead by means of a nut and taper fit instead of a key. Since this design has been introduced there have been no failures of piston rods with the Vaucain compound, so far as we can learn.

Figs. 2 and 3 show the improved cast iron, cast steel and wrought iron pistons. The wrought design is fig. 2, where there are a less number of ribs. The cast design is fig. 3. The general features of construction are the same in both. The heads are made in two parts, and riveted together at the end of each spoke. The wrought iron heads are made in dies, while the cast ones are made in molds, as usual. As with the crossheads, a



tinned surface is used with the cast steel and wrought iron pistons where the piston bears against the cylinder, and the whole surface of the piston heads is tinned $\frac{1}{8}$ in. thick on the outside.

The weights of these pistons are as follows: Wrought iron, fig. 2, 171 lbs. without the rods; cast iron, fig. 3, 191 lbs. without the rods. The weight of the old style light form of solid cast iron head, with the ring sprung of the same diameter, is 200 lbs. without the rod. The saving in the case of the cast iron piston of the new type is 10 per cent., and with wrought iron 20 per cent. Therefore, with the new type of cast steel crosshead and wrought iron piston here shown there is 20 per cent. saving in the weight of these parts, which nearly corresponds to 15 per cent. saving in the weight of the counterbalance. This saving is certainly worth more in its reduction of wear and tear to the permanent way than any reasonable additional cost for the lighter reciprocating parts.

Brake Tests on Lehigh Valley Railroad.

Some tests were made last week on the Lehigh Valley railroad between Pottsville and Clinton of the New York and the Westinghouse air brakes on a 50-car train. The following is the official report.

The tests took place Feb. 16, 17 and 18, 1892, and were conducted by R. H. Wilbur, Assistant to Second Vice-President; J. I. Kinsey, Master Mechanic; J. S. Lentz, Superintendent Car Department; James Donnelly, Superintendent N. J. Division, and D. L. Barnes, of the Railroad Gazette. [There were present also several other officers of the Lehigh Valley and of other railroads and representatives of the competing brakes.—EDITOR.]

Brakes Tested.—New York Air Brake No. 2 triple valve, with Westinghouse engineer's valve; same with New York engineer's valve. Westinghouse Air Brake, with Westinghouse engineer's valve.

Order of Tests.—Feb. 16, N. Y. Air Brake, Westinghouse engineer's valve.

NOTE.—These tests were very unsatisfactory owing to the disagreement as to the nature of the tests to be made, the

presence of too many men on the engine and the refusal of one of the companies to take part in the proposed plan for tests under all conditions of service. Therefore a new plan was ordered by the officers of the road to be followed strictly, with only one disinterested party on the engineer's side, with the engineer and one representative of each brake company on the fireman's side. Mr. Elder, brake expert of the Pennsylvania road, was chosen for the disinterested party on the engine and written instructions were furnished him and were strictly followed on the succeeding tests.

Feb. 17, Westinghouse air brake and engineer's valve. Complete schedule of tests No. 1 to No. 10.

Feb. 18, N. Y. air brake in morning with Westinghouse engineer's valve. Complete schedule of tests No. 1 to No. 10. N. Y. air brake in afternoon, with N. Y. engineer's valve. Tests No. 1 to No. 4, inclusive only. Tests of the N. Y. engineer's valve were omitted by request of Mr. A. P. Massey, Mechanical Engineer of the New York Air Brake Co.

Description of Schedule of Tests.—Test No. 1. 30 miles per hour; down 47 ft. grade; 70 lbs. train pipe line; air let out for 1 sec. through emergency port. Throw handle to lap and release with all excess gained at time of full stop. Record all cars released by hand.

Test No. 2.—Same as above, except at 40 miles per hour.

Test No. 3.—Same as above, except at 30 miles per hour.

Test No. 4.—Same as above, except at 20 miles per hour.

NOTE.—Engineer to be pulling out when brakes are applied. Test No. 5.—Standstill; 70 lbs. train pipe; 50 cars; air all out emergency. Release with 90 lbs. main res. pressure through full release port. Brakes to be pumped off with Westinghouse pump only. Record brakes released by hand.

Test No. 6.—Cut out 10 cars, Nos. 15 to 24 inclusive, look for emergency at rear. If not obtained, cut in No. 21, etc., until it is obtained.

Test No. 7.—Standstill emergency; 70 lbs.; air all out of train pipe. Release by admitting air from main reservoir at 100 lbs., through service port. Use both pumps until 110 lbs. has been obtained. Then shut off New York No. 2 pump. Record brakes released by hand as soon as train line pressure reaches 70 lbs.

Test No. 8.—One car graduation test; 70 lbs. Let out as follows:

First, 7-4-4-4-3.
Second, 6-3-3-2-2.
Third, 4-2-3-4-1.
Fourth, 8-3-3-3.
Fifth, 8-3-3-3-3.
Sixth, 9-9-19.
Seventh, 9-6-4.
Test No. 9.—One car test. Hold on for grade. Put 27 lbs. in cylinder, and observe fall in pressure in cylinder or rise in pressure after 2, 3 and 4 minutes.

Test No. 10.—One car test. All air out through service port. See if it applies emergency.

Remarks.—Patterson to Clinton going east; down grade 47 ft. per mile.

Fifty Lehigh Valley empty freight box cars, all new. These cars have the Gould coupler and National hollow brake beam.

There were four slidometers, two in front and two in rear car. The slidometer shocks are marked + when to ward the engine and - toward rear. The records of the electric recording apparatus used are not included here, owing to lack of harmony in the results, due principally to the nature of the electric contacts under the cars. Hereafter they should be attached to the piston rod so as to return automatically.

The slight discrepancies noticeable in the readings of the pressure gauges are common to this class of gauge. It is seldom that they agree within 2 lbs., and one gauge of this lot was 5 lbs. too low.

The driver brake shoes were in good condition.

The tail bolts broke either under the head or at the keyway. They appeared to have been overheated in manufacture. These breakages occurred without there being indications of such severe stresses in the train as were shown at Burlington.

The wide variation in the shock in the rear car was largely due to the way in which the engine was handled. If it was pulling out hard at the time the brakes were applied, then a greater shock was produced. Owing to the varying conditions, the shocks given are not comparable. There is no apparent reason for the wide variation of shock under what seems to be the same conditions, otherwise than that of handling the engine as just mentioned. The tightness of the train was tested and found to be such as would not interfere with a proper action of the brakes.

The graduation tests made are not sufficient to establish the action of the brakes on a long train after service, when the parts are somewhat gummed up. A proper test can only be made by putting a train in service, where it can be left together and the results gathered from time to time. One test that should be made in addition to the foregoing is that of descending a long grade with uniform speed, but this can only be properly done after the cars have been in service for some time. Triple valves just out of the shops may be expected to work freely and graduate and release well. Graduation and release tests can only be made satisfactory after the valve has become somewhat gummed up, and contains some considerable amount of grit in the working parts.

For emergency stops it matters not whether the valves be old or new. The quick action feature is quite independent of grit or gum, and it out of order will generally make that fact known automatically. The length of the stops in the tests are all too long and if the train was a fully loaded one they would be too long to be as safe as an air braked train is generally expected to be. The reason for these long stops is either in the hardness of the brake shoes or the brake leverage, or perhaps both. There was no lack of air pressure in the cylinders. There is no danger of pressure in the cylinders. There is no danger of skidding wheels with the small retarding force now had with these cars but later, as the shoes became more worn, the interior may be softer and the retarding force be increased. Possibly the shoes are soft enough and will be quite sufficient after more wear.

New York Air Brake, Feb. 16, 1892.

No. of tests	1	2	3	4
Condition of rail	Good.	Good.	Good.	Good.
Speed, miles per hour	20	41½	32	25½
Train pipe pressure, front	70	61	62½	70
Train pipe pressure, rear	68	64	65	68
Equalized pressure, front	68	47½	48	50
Equalized pressure, rear	68	47½	48	50
Distance run, feet	22½	1,181	603	407
Slideometer, front No. 1	11½	3½	1½	1½
Slideometer, front No. 2	9½	1½	1½	1½
Slideometer, rear No. 1	9½	1½	1½	1½
Slideometer, rear No. 2	9½	1½	1½	1½
Brakes released by hand	Not examined.	2 reported at front	0	2 reported at rear

Link broke between tender and first car.

Damage to train.....

Tests No. 5 to No. 11 not made on this date; omitted owing to protest of N. Y. Air Brake Co.

Westinghouse Air Brake, February 17, 1892.

No. of Test	1	2	3	4
Condition of rail	Good.	Good.	Good.	Good.
Speed, miles per hour	20	41½	30	24
Train pipe pressure, front	71	71	71	72
Train pipe pressure, rear	69	70	70	70
Equalized " front	69	60	60	60
Equalized " rear	55	55	55	55
Distance run	22½	1,128½	500½	263
Slideometer, front No. 1	1½	3½	3½	3½
Slideometer, front No. 2	1½	1½	1½	1½
Slideometer, rear No. 1	9½	7½-2	10½	15
Slideometer, rear No. 2	9½	12-3	24½	19½
Brakes released by hand	None.	None.	None.	None.
Damages	No damage	No damage	Broken tail bolt, 25th car, middle of train.	Broken tail bolt, 25th car, middle of train.

Westinghouse Air Brakes.

Test No. 5.—Brakes all released.

Test No. 6.—With rapid repetition of tests from 10 cars cut out down to 4 cut out the quick action passed 4 cars.

Test No. 7.—Brakes all released.

Test No. 8.—Westinghouse Air Brake.

Train pipe pressure, 74 lbs.	0	8	3	3
Reduction on engine	0	22	50	55
Pressure in cylinder	0	7½	22½	48
Train pipe pressure, 74 lbs. <td>0</td> <td>7</td> <td>4</td> <td>4</td>	0	7	4	4
Reduction on engine	0	10	27	30
Pressure in cylinder	0	6	3	5
Train pipe pressure, 74 lbs. <td>0</td> <td>7½</td> <td>22½</td> <td>27½</td>	0	7½	22½	27½
Reduction on engine	0	4	3	3
Pressure in cylinder	0	7½	13½	27½
Train pipe pressure, 74 lbs. <td>0</td> <td>9</td> <td>9</td> <td>10</td>	0	9	9	10
Reduction on engine	0	7½	37½	30
Pressure in cylinder	0	9	6	4
Train pipe pressure, 74 lbs. <td>0</td> <td>9</td> <td>23½</td> <td>42½</td>	0	9	23½	42½
Reduction on engine	0	9	6	4
Pressure in cylinder	0	9	23½	42½

Test No. 9.—27 lbs. in brake cylinder. Increased to 47½ in minutes, while train pipe decreased from 60 to 52 lbs.; thus lbs. reduction in train pipe put 20½ into cylinder.

Test No. 10.—No emergency.

New York Air Brake, Feb. 18, 1892.

No. of test	1	2	3	4
Condition of rail	Good.	Good.	Good.	Good.
Speed, miles per hour	21	40½	34	28
Train pipe pressure, front	70	71	71	71
Train pipe pressure, rear	71	70	60	60
Equalized pressure, front	62	60	60	60
Equalized pressure, rear	39	57½	37	37
Distance run	234	1,036	710½	474
Slide meter, No. 1	1½	2½	1½	1½
Slideometer, No. 2	1½	2½	1½	1½
Slideometer, No. 1	2½	2	1	1
Slideometer, No. 2	4½	3½	4½	10½
Brakes released by hand	4	15	9	11
Damages	Broken tail bolt.	No dam. age.	No dam. age.	Broken bolt.

New York Air Brake.

Test No. 5.—16 brakes "stuck on."

Test No. 6.—With rapid repetition of tests from 10 cars cut out down to 2 cut out the quick action passed 2 cars. Tried again by request of N. Y. A. B. Co., to see if it would pass 3 cars with full train pipe pressure of 70 lbs. after full charging of reservoirs. It failed to pass 3 cars.

Test No. 7.—21 brakes "stuck on."

Test No. 8.—New York Air Brake.

Train Pipe Pressure, 71 lbs.	0	7	4	4
Reduction on engine	0	21	47½	52
Pressure in cylinder	0	14	41	52
Train pipe pressure, 70 lbs. <td>0</td> <td>6</td> <td>3</td> <td>5</td>	0	6	3	5
Reduction on engine	0	4	2	3
Pressure in cylinder	0	7	15	32
Train pipe pressure, 70 lbs. <td>0</td> <td>8</td> <td>3</td> <td>3</td>	0	8	3	3
Reduction on engine	0	24	35	50
Pressure in cylinder	0	27½	34	47½
Train pipe pressure, 70 lbs. <td>0</td> <td>9</td> <td>9</td> <td>19</td>	0	9	9	19
Reduction on engine	0	10	42	46
Pressure in cylinder	0	9	6	4
Train pipe pressure, 70 lbs. <td>0</td> <td>19</td> <td>35</td> <td>50</td>	0	19	35	50
Reduction on engine	0	19	35	50
Pressure in cylinder	0	19	35	50

It was attempted to repeat this test with the N. Y. engineer's valve, but their representative protested against it and it was discontinued.

Test No. 9.—N. Y. Brake.

Twenty-seven pounds in cylinder remained at 27 for 4 minutes while train pipe decreased from 60 to 54 and did not cause increase in cylinder pressure. Probably reservoir pressure decreased with train pipe pressure through leakage of triple valve piston. See remarks about the need of some considerable service before making these tests.

Test No. 10.—N. Y. Brake.

No emergency with Westinghouse engineer's valve.

Quick action took place with the N. Y. engineer's valve on the first trial. Further tests of this engineer's valve were discontinued by request of the representative of the N. Y. Air Brake Co.

N. Y. Air Brake, Feb. 18, 1892.

Operated by N. Y. pump and engineer's valve.

No. of test	1	2	3	4
Condition of rail	Good.	Good.	Good.	Good.
Speed, miles per hour	21	41½	34½	28½
Train pipe pressure, front	77	70	72½	73
Train pipe pressure, rear	75½	68	70	70
Equalized " front	66	62½	62	61
Equalized " rear	62½	57	58	57
Distance run	240½	1,070	657½	460½
Slideometer, front No. 1	1½	2½	2	1½
Slideometer, front No. 2	1½	2	1½	1½
Slideometer, rear No. 1	3½	1½	3½	1½
Slideometer, rear No. 2	9½	0½	7½	1½
Brakes released by hand	5	None.	21	Not examined.
Damages	Broken tail bolt.	No dam. age.	No dam. age.	No dam. age.

Summary of Release Tests.

1st.—When released after emergency stops on grade under favorable circumstances. The exact details of the method of release is given under the description of how tests No. 1, 2, 3 and 4 were made.

1st Trial.
Total cars with brakes "stuck on."
1st stop. 2d stop. 3d stop. 4th stop.
See foot note.

2d Trial.
1st stop. 2d stop. 3d stop. 4th stop.
15 9 11

3d Trial.
1st stop. 2d stop. 3d stop. 4th stop.
5 0 21 not exam'd.

W. A. Brake...... None. None. None. None.
Only one trial made of W. A. B.
NOTE.—On these four runs the record was not kept accurately. A N. Y. air brake man went along the train at each stop. Ten brakes in all were reported "stuck on." On the second and third trials Lehigh Valley man kept the records of brakes released by hand.

2d Standing Release Test No. 5.
This test was not made on the first trial of N. Y. B., as the company protested against it, and expressed the opinion that it was unfair, and not in accordance with actual service. The test was made on the second trial:

Westinghouse Brake..... No Brakes "stuck on."
New York Brake..... 16 cars stuck on.

3d Standing Test No. 7.

This test was protested against by the N. Y. B. Co. on the ground of unfairness and was therefore not made until second trial.

N. Y. Brake...... 21 cars "stuck on."
Westinghouse Brake...... No cars "stuck on."

The following are the numbers of the cars having New York brakes, on which the brakes had to be released by hand. The number of times each car was released appears after the number of the car:

63,803	3	63,822	1
63,804	4	63,823	6
63,805	2	63,824	1
63,806	4	63,825	3
63,807	1	63,826	3
63,808	1	63,827	3
63,809	7	63,828	2
63,810	3	63,829	4
63,811	1	63,830	3
63,812	2	63,831	3
63,813	1	63,832	3
63,814	5	63,833	3
63,815	1	63,834	3
63,816	1	63,835	3
63,817	1	63,836	3
63,818	1	63,837	3
63,819	1	63,838	3
63,820	1	63,839	3
63,821	1	63,840	3
63,822	1	63,841	3
63,823	1	63,842	3
63,824	1	63,843	3
63,825	1	63,844	3
63,826	1	63,845	3
63,827	1	63,846	3
63,828	1	63,847	3
63,829	1	63,848	3
63,830	1	63,849	3
63,831	1	63,850	3
63,832	1	63,851	3
63,833	1	63,852	3
63,834	1	63,853	3
63,835	1	63,854	3
63,836	1	63,855	3
63,837	1	63,856	3
63,838	1	63,857	3
63,839	1	63,858	3
63,840	1	63,859	3
63,841	1	63,860	3
63,842	1	63,861	3
63,843	1	63,862	3
63,844	1	63,863	3
63,845	1	63,864	3
63,846	1	63,865	3
63,847	1	63,866	3
63,848	1	63,867	3
63,849	1	63,868	3
63,850	1	63,869	3
63,851	1	63,870	3
63,852	1	63,871	3
63,853	1	63,872	3
63,854	1	63,873	3
63,855	1	63,874	3
63,856	1	63,875	3
63,857	1	63,876	3
63,858	1	63,877	3
63,859	1	63,878	3
63,860	1	63,879	3
63,861	1	63,880	3
63,862	1	63,881	3
63,863	1	63,882	3
63,864	1	63,883	3
63,865	1	63,884	3
63,866	1	63,885	3
63,867	1	63,886	3
63,868	1	63,887	3
63,869	1	63,888	3
63,870	1	63,889	3
63,871	1	63,890	3
63,872	1	63,891	3
63,873	1	63,892	3
63,874	1	63,893	3
63,875	1	63,894	3
63,876	1	63,895	3
63,877	1	63,896	3
63,878	1	63,897	3
63,879	1	63,898	3
63,880	1	63,899	3
63,881	1	63,900	3
63,882	1	63,901	3
63,883	1	63,902	3
63,884	1	63,903	3
63,885	1	63,904	3
63,886	1	63,905	3
63,887	1	63,906	3
63,888	1	63,907	3
63,889	1	63,908	3
63,890	1	63,909	3
63,891	1	63,910	3
63,892	1	63,911	3
63,893	1	63,912	3
63,894	1	63,913	3
63,895	1	63,914	3

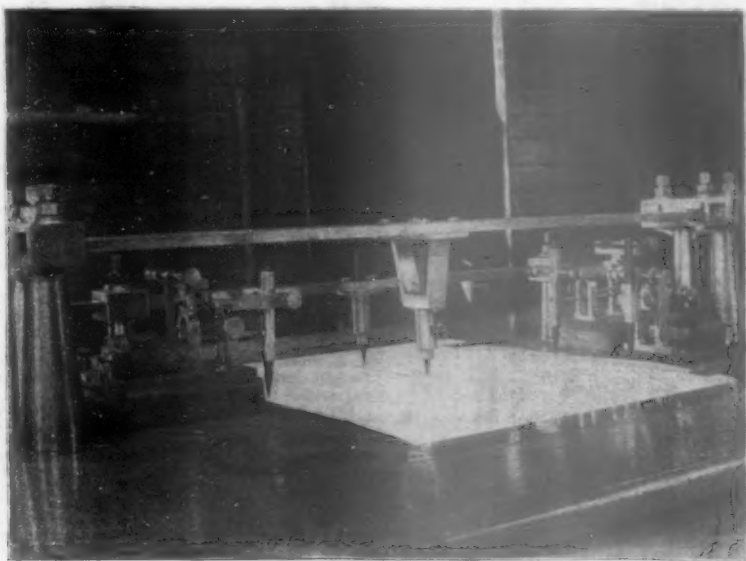
paper and fibre roofs recently introduced, which, in my opinion, are well worthy of consideration. Special claims are made that they are economical for use in repairs of old double board roofs several roofs, our own line included, are making tests of these roofs, and inspection reports of them received so far, are quite favorable. Recent patents and designs of steel or galvanized iron, water and fireproof roofs have been got out, and are now receiving the attention of railroad people. Estimates and reports also show that these roofs are manufactured and applied at a cost within the desired limits, and together with radical changes in design, are being favorably entertained.

Taking three or four styles of the most prominent roofs it will be found that the average number of parts (less nails, screws, washers, etc.) aggregates 338 pieces to the car; multiply this number by the number of box cars on some of our larger lines, say 7,000 cars, it makes the exceeding large number of 2,300,000 to be watched by our inspectors and kept in order.

Several car builders, as well as myself, have frequently mentioned the fact that our Master Car Builders' Association has not given the question of improving car roofs proper attention, and it will be noticed that there was no committee appointed to report on this subject at the next annual convention. I believe the roof question will be a profitable one to consider, otherwise, the progress in roofs will not keep pace with other parts of car construction.

Recording Apparatus in Dynamometer Car—Burlington Brake Trials.

Last week we gave the diagrams from the dynamometer car used at the recent Burlington brake test. Those diagrams were taken with an apparatus almost identical with that used at the Burlington brake trials



Recording Apparatus in Dynamometer Car—Burlington Brake Trials.

in 1887. The arrangement of pencils and the recording mechanism is shown by the half-tone cut made from a photograph taken during the recent tests. It will be noticed that there are five stylograph pencils on the paper. Of the two centre pencils, one describes the uniform base line and the other the variation in pull on the drawbar of the dynamometer car. One of those on the edges makes a short mark at every second and the distance between these marks indicates the speed in miles per hour, as the paper, also shown in the cut, travels at a speed directly proportional to the speed of the car along the track. The other pencils are intended to record special data, such as the passing of mile posts, the time of brake application, or any other desired information.

Smoke Prevention.

Pittsburgh was once the blackest city on earth, with the possible exception of Birmingham. Then came the profuse use and wanton waste of natural gas, and the era of blue sky. Now, with the gradual return to coal, the citizens are, like those of Chicago and some other cities, looking for the way to abate the "smoke nuisance." As a contribution to the discussion Capt. William Metcalf addressed the Engineers' Society of Western Pennsylvania, at its last meeting, on "Smoke." Extracts from his address follow. We regret that the exigencies of the editorial blue pencil have compelled us to cut out all but the bare skeleton. Those who know Mr. Metcalf's humor, and his command of English idiom, will understand what they lose and some of them will send for the complete paper.

The combustion of coal involves two processes, first, the conversion of the carbon to the condition of gas or vapor, and the second the union of the carbon with the oxygen of the air. This union produces the intense heat so familiar to us all, and the product of combustion when complete is carbonic acid. . . . The difficulty of mixing the gases to produce perfect combustion is so great as to be practically impossible; if we burn all of our carbon to carbonic acid we have inevitably a large excess of air going through our fire, and if we do not burn it all to the carbonic acid in the few moments at our disposal in the furnace, there is a deficiency of air, and the excess of carbon is wasted in the form of carbonic oxide, half burned carbon; or in vaporized carbon

which is thrown off with great rapidity in the dense black vapor which we call smoke. In the intense heat of a fiercely burning fire bituminous coal is vaporized with such great rapidity that it is impossible, practically, to burn it all before it flies to the chimney and passes beyond the reach of combustion, but much may be done, by steady mechanical firing in small quantities at a time, to reduce the smoke nuisance, where the most intense heat is not necessary, and where other and more important matters do not make other methods of firing imperative.

We cannot produce the soft, white, radiating flame without some smoke, because we cannot attain an exact balance of the gases, and therefore to maintain such a flame we must have a deficit of air, a surplus of carbon and some smoke.

There is no smoke from a blast furnace, because coke is used, but the vapors of a blast furnace are far more deadly than smoke, only they are white and so they do not count.

With natural gas the common puddling and heating furnaces do not make much smoke, but the awful waste of gas is a sin for which Pittsburgh is paying dearly now, and must continue to pay for many years to come. Did we have five years of comparatively smokeless puddling and heating in reverberatories? Then we used up 30 years' supply of the precious fluid in doing it. And some of us are still shooting it up our stacks in the same happy-go-lucky, devil-may-care style.

When we come to the regenerative furnaces one would say, naturally, here at least there is no excuse for smoke. Many of us thought so, and many of us tried it. I have seen hundreds of valuable crucibles cut down and the furnaces cut down and destroyed in the beautiful blue-white combustion flame, and yet the steel in the crucibles was not melted properly. Tons upon tons of iron and steel have been wasted away in the same beautiful flame, and yet the masses were not heated through nor in the condition to be worked. Now, the

rattled, and vibrated, and perfect combusted, and didn't make steam, was a sight to behold once in a life time. And the way I shook and trembled with fear while that was going on was an experience to be endured not more than once in a life. After an expenditure of much time, some thought and considerable money, a partially regenerative fire was adopted, by which with from two and a half to three ounces of gas, we can keep up steam nicely, but, singularly, when the gas is very low, when every atom seems necessary, then to keep up steam at all we must exclude any surplus air so thoroughly that now our boiler stacks smoke a little; only a little, still they do smoke; and so the evidence of the best practice again is a little smoke in the stack.

The next thing to consider is what do we lose by smoke. There are smoke consuming devices advertised claiming savings in fuel of from 10 per cent. to 25 per cent. The best authorities I know of give the extreme of loss from smoke as 5 per cent. and the mean loss from average firing as 2 per cent. Therefore, if the devices mentioned do save from 10 per cent. to 25 per cent. of fuel they are misnamed; instead of being called smoke consumers they should be named heat savers. That such saving over ordinary wasteful methods can be made there is no doubt, and if in doing so they save the 5 per cent. that goes as smoke and prevent the smoke, so much the better, provided that in furnace firing they do not burn up ten times this value in iron or steel or valuable refractories, or all three together. It is certain that the best and most economical appliances will produce a minimum of waste and a minimum of smoke, but not an entire absence of smoke.

Can smoke be prevented by the use of coke? Undoubtedly, if coke can be made without smoke. It would be hard to point out anything dirtier or nastier in the way of a smoke nuisance than a coke oven. But coke is made out in the country, not in the city. Well, is not the country bigger than the city; with more people than the city? Is it not far more beautiful than the city, and of much greater value than the city? What is art but a mean imitation of nature? and are we to daub and smear the whole face of nature to save a few puny works of art? Let us have coke by all means, but first let us have it made without smoke; let us be at least decent to our neighbors while we are being kind to ourselves.

If what has been said is correct, it may be a fair conclusion that some restrictive legislation, wisely planned against excessive smoking might be good for the community; on the other hand, it would be equally fair to say that prohibitive legislation would be sure to defeat itself.

But there is a health association after the smokers and we must consider the question of the health of the community as it is affected by the smoke. I assert that there is nothing particularly unhealthy about smoke, on the contrary it may mitigate other and worse evils. A reference to statistics will show that this city is not particularly unhealthy, but that on the reverse it enjoys a rather low death rate. A contemplation of the beautiful clear air of our Atlantic seaboard cities, the most beautiful cities in the world, is apt to fill a Pittsburgher's heart with envy; but in spite of clear air and balmy sea breezes, those cities are not healthier than we are. Their anthracite coal gives off as much carbonic acid, carbonic oxide, sulphurous acids and other poisons as it is possible to get from our bituminous coal. Who that has ever inhaled the burning, biting fumes of anthracite would not infinitely rather have a dose of our blackest smoke? Woe to the weak pulmonary organs that breathe anthracite fumes, there is no unctuous, protecting coat of soft, pure carbon to save them from torture and destruction. A few years ago none but the most robust could hope to live in our windy, dusty lake cities. Why is it that we hear so little of those terrors nowadays? There is no difference, except that we have sent them lots of coal, plenty of smoke, and have painted and protected their bronchia and appurtenances with a generous coat of our all-protecting carbon.

All returning travelers from Colorado are justly in ecstasies over the wonderful scenery and the marvelous air, yet wise old doctors out there, who know, tell us that there is not a healthy woman in Colorado; and I heard of one old rascal who said there was not a good-natured woman there either.

DISCUSSION.

Mr. KOCH said that he had worked for many years in Birmingham, and that it was a sad sight to see that city to-day, clean in atmosphere and deserted by workmen. The streets may be clean and the smoke gone, but it is because the men who made the smoke, are gone. Since steel has taken the place of iron, and puddling has ceased, there is no smoke, for Birmingham to-day only manufactures fine grades of finished product. He endorsed Mr. Metcalf stating that smoke might be lessened but could not be abolished. When working under Dr. Percy in London, he had to appear before the Committee of the House of Commons as a witness, and that it was proven before that committee that every household delivered four times as much smoke from each square foot of grate surface as any manufacturer. It is easy to reduce smoke from boilers in a mill, running constantly and evenly for 10 hours, such as a cotton mill; but it is impossible to prevent smoke in an iron or steel mill where the boilers are subject to demands for large amounts of steam at one moment, and then suddenly dormant.

Steel Car Construction.

BY G. L. HARVEY.

I have read with much interest Mr. Barnes' valuable paper on "Recent Progress in Car Construction," given in your paper of Jan. 29 and Feb. 5. I wish to call attention to a few important details apparently overlooked in the designs he discussed, speaking in a general way on a few other items.

The great setback to the introduction of steel cars has been the poor designs which have been offered. Many seem to think because the frame of a car is steel that fact alone is a guarantee of its value and enormous endurance. For example, you will see designs where a 5 x 9 yellow pine timber is replaced by one 6 in. or 7 in. channel, weighing from 7 to 10 lbs. per lineal foot, with a cross-sectional area of 2½ in. against 45 sq. in. of the pine timber. Again an oak end sill 6 in. x 8 in., or even larger, is replaced by a 7 in. or 8 in. channel, with web and flange of ¼ in. or ⅝ in. thickness. If you take a 6-in. steel channel, 34 ft. long, and support it at each end with its web in a horizontal plane, you will find that it

weight alone will deflect the channel about 18 in. This piece is substituted, as I say, for a 3 in. x 9 in. timber. Designers go further by taking one of these channels and filling it full of holes from one end to the other; take a 7-in. channel with a 2-in. flange; see fig. 1. The sketch shows a section drawn to scale with the portions cut away by a $\frac{3}{8}$ in. bolt or body brace rod. A hole is also shown for $\frac{1}{2}$ in. bolt for holding a floor strip. This detail is found in nearly every car design which has been offered. The strength of such a sill for carrying the load must be calculated on this reduced section. Then again calculate, or test if you please, the strength of such a sill under compression and it will be found to crumple under a very light load. When such a member as this is substituted in place of a 5 x 9 timber what must be the results?

The following construction has been offered to overcome these objections in the endeavor to improve car design: Two 6-in. steel channels, weighing 7 lbs. per ft., are placed opposite each other as shown in fig. 2. These channels are connected by means of clips or lattices made of $\frac{3}{8}$ in. x 2 in. steel, bent over at each end, the bolts for attaching parts, such as the bolster, pass through the clamp between the two separate members, securely tying the two channels when the bolt is drawn in place. The result of this construction is that the channels are not weakened by puncturing, the double beams will stand an enormous load in compression, the sills will not deflect sideways under loads and bumps of service, the sills are as strong at the connection as at any other point, the sill thus constructed is virtually a lattice column, and had all the benefits of lattice construction without its expense of riveting, the bolts for securing the parts of the car performing the duty of the rivets in the lattice column. The car has greater flexibility than a riveted one, as the sills are free to twist between each clamp. It is seen that any connection, such as a needle beam, bolster, post, or floor, has a bearing of about 5 in. from one side of the sill to the other, against 2 in. when a single channel is used in the ordinary steel car design. This feature gives greater strength to the body of a car to resist the strains from a rolling motion. The clamps distribute the strains on the bolts at such a point as the bolster, where three bolts are used, giving enormous resistance against movement of parts along the sill, the clamps at such a point being $\frac{1}{2}$ in. thick, and long enough to take in all the bolts; the long clamp at a post received at its middle, the bolt for securing the post to the side sill—at one end of the clamp the body brace rod—and at the other the bolt for securing the body brace; in this way all the parts are securely anchored to the sill.

Again, many steel car designers think that if a car will carry the load it is entirely satisfactory, but in my experience this is the least of all strains on the under frame. You will find that if steel cars are strong enough to stand bumping together they will be amply strong for the dead load in the box. The double form of plate has the same merits as the sill, and affords strong attachment for the posts, carlins, side body braces and rods. When a bolt is drawn up the flanges of the channels spring just enough to completely lock the nuts of the bolts. The danger of loose nuts has always been a great objection to metal cars, as bolts between two flat pieces of metal which are in such a position as to slide with regard to each other are sure to work loose as generally designed. This double sill, however, affords a spring lock nut on an enormous scale, for all bolts where required in the floor system. This item alone I consider of the greatest value in this design, and it adds greatly to the durability of this construction.

The single channel end sill, or an end sill made of a flanged plate is very commonly seen in steel car designs. If the car is cambered upward slightly when loaded, the

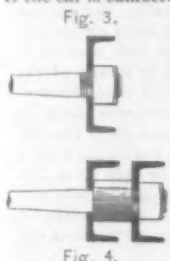


Fig. 3.

load in the car and the weight of the car body must be carried on the truss rods; this means that each truss rod will pull in on the end sill with about 10,000 lbs. at each nut. I have sketched a 7-in. channel with a $\frac{1}{2}$ in. rod upset to $\frac{1}{4}$ in. passing through such an end sill and secured with a nut (fig. 3). It is clear without any calculation that the web of this end sill is strained very near its breaking point, and will give little or no service. Fig. 4 shows a method of overcoming this difficulty by using two channels separated by a thimble, the nut bearing against the centre sill, the thimble distributing the loads between the two members. I find that this gives a very strong and simple form of end sill.

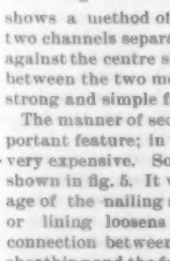


Fig. 4.

The manner of securing inside lining is another important feature; in most cases it is very poor and often very expensive. Some of these types of attachment are shown in fig. 5. It will be noted in all cases, the shrinkage of the nailing strip or lining loosens the connection between the sheathing and the frame of the car. This defect is overcome in the Harvey car; see fig. 6. The post is U shaped, and the nailing strip is secured to the



Fig. 5.

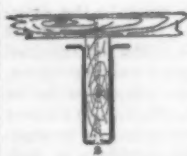


Fig. 6.

post by a screw at S. The strip is slightly wider than the post, so that when the wood shrinks the sheathing is brought a little nearer the frame, but the connections are not loosened. Ordinary car sheathing is used and nailed to the strips. The roof is made as follows: The carlins are covered with $\frac{3}{8}$ in. sheathing, dressed and matched; on this are laid across the car $\frac{1}{2}$ in. battens, see fig. 7, about 26 in. apart. A metal sheet is laid over this batten with a special bent edge. The adjoining sheet is laid with its interlocking edge over the margin of the first sheet, the two are then securely nailed through the $\frac{3}{8}$ in. strip to the roof sheathing by a barbed nail. It will be seen that the covering strips are one with the sheet. Each joint in the roof having but one opening, one side at M is unbroken, and any water at N would have to pass through the open space R and over between the sheets on top of the strip, which is almost an impossibility. The open space stops any possible capillary action. When the roof is laid the space between the joints is coated with some heavy paint; the roofing is, of course, painted both sides before being laid. The sheets can be readily replaced, the wooden sheathing prevents sweating which would occur with an all-metal roof. The sheathing also prevents the joints being torn open by walking on the roof close to a joint; the cost of this roof is very low.

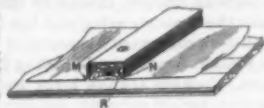


Fig. 7.

The bolster design is one of vital importance, as the weight of body and load are concentrated at that point. Most forms of bolsters would be properly designed if they had only centre and outside sills to carry, the intermediate sills, however, throw a strain on the bolster which is resisted only by the transverse, and not by tension or compressed strength of the bolster members, thus making the car ride side down on the outside bearing, the bolster tending to take the form shown in fig. 8.



Fig. 8.

Some roads have filled the space between the bolster members and between the sills by cast iron fillers, in order to prevent the bolster from sagging; this is but a very poor remedy, as this construction would require perfect fitting and sills that would not shrink—two requirements which are very seldom found in car construction. With a small centre sill, a straight compression member can be used in a bolster with fair results, but when a deep centre sill is desired this straight bolster is out of the question, as the arch bars will strike the bolster unless a very high centre plate is used. The bolsters shown in fig. 9 is designed to overcome these objections. Two traverse I-beams are placed in the bolster extending from one outside bearing to the other, carrying the two large centre sills and the intermediate sills (see cross section of bolster, fig. 9a). The tension members and lower compression member—which is a channel in this case, bent up from the outside bearing—carry only the outside sills. This bolster keeps the car up from the outside bearing, and maintains the proper position of all connected parts, at the same time using a low centre plate and the ordinary arch bar form of truck. This bolster weighs much less than the ordinary flat bolster of the same capacity.

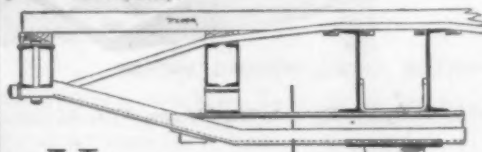


Fig. 9a.

Fig. 9.

The best designers prefer placing the line of draft inside the top and bottom of the sills. This is doubtless a very wise step, as the bending or hook action of a draw gear below the sills increases enormously the strains on the floor system. In order to overcome this hook action continuous draft sills are sometimes used by putting in timbers between the inner ends of the draft timbers. This added material does not meet the results obtained by a deep metal centre sill, as the carrying capacity of this car is not increased nor the strength of the car over the bolster, which is desirable to prevent the ends from going down. The design shown in fig. 10 represents two 12-in. channels, 10 in. apart, extending from one end of the car to the other, and the inside webs of these channels at each end are riveted to draft plates. These plates are bent around two malleable fillers, which have apertures to receive upper and lower guides. The draft plates are secured to the sills by 11 $\frac{1}{2}$ in. rivets, thus bringing into play 22 $\frac{1}{2}$ in. rivets on each draw gear. These draft plates are not only riveted at their ends, but countersunk rivets are placed between the lugs so that it is impossible to lift lugs at their inner end when struck by the follower plate. A rivet passes through the malleable filler and

the channel, thus increasing the attachment of the draft lug. The drawbar extends out below the end sill, the centre sill being 12 in. deep and the end sill but 6 in. I prefer this design to that where the drawbar is passed through the end sill, which would require a $\frac{5}{8}$ in. x $\frac{5}{8}$ in. hole and the use of a tail bolt. The expense of increasing the strength of the end sill on account of this large hole does not justify the end in metal cars. It will be seen that either a spring pocket or tail bolt can be used with this design, see fig. 10, and in case a drawbar breaks, a spring pocket, tail bolt or a follower, the bar can be pulled out without damaging the end sill or other parts of the draft rigging. The draft rigging is continuous through the train, both in pulling and bumping. This draft rigging is exactly the form suggested by Mr. Barnes, where he advises replacing the two wooden centre sills in the Chicago, Burlington & Quincy cars by two deep steel channels.

Wooden deadwoods are used about 7 in. thick, making 14 in. of wood in the length of the car to act as cushions in switching or sudden stops when the drawbar safety stop strikes the deadwood. A 1 in. x 4 in. yoke supports the outer end of the drawbar below the end sill. The deep metal centre sill prevents the car from bending down over the bolster, prevents "hogging up," gives a continuous form draft gear, and brings the line of draft inside the centre sills. The fact that timber of sufficient size cannot be obtained free from shakes and other defects will always prevent the enormous advantages of the metal sill being obtained in wooden cars. Prices of steel are continually growing less and less, and will un-

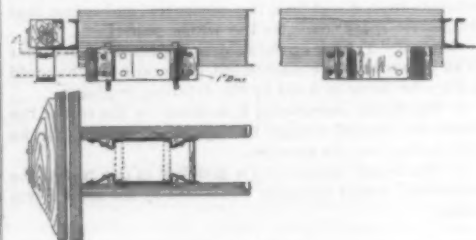


Fig. 10.

doubtedly continue to do so as competition increases. A steel car can be built at a slight advance over wooden cars, but the longer life and reduction of repairs make them now of enormous value to car owners. Cars of small capacity cannot be built to compete with wooden cars for small trains using hand brakes on light grades, but cars above 50,000 capacity, 34 ft. and over in length, cannot be designed in wood to compete with steel construction for use in hard service. The advantage of steel cars over wooden are far greater than the air brake over hand brake, and the metal brake beam over the wooden beam, while the increased cost is far less in proportion. I am backed in my conclusions and statement by the practical operations of 50 of these cars, which have been running in all kinds of service for several months and of several types, viz., box, stock, gondola and flat cars, and I think I can say they have given uniformly satisfactory results, much better than the most enthusiastic had anticipated.

The Relative Value of Firebox and Tube Heating Surface.

In a paper by Mr. E. Sauvage on the "Production of Steam," published in the *Bulletin de la Commission Internationale du Congrès des Chemins de fer*, a brief account is given of tests made by Mr. Almgren in Sweden to determine the relative value of heating surface in the firebox and in the tubes. The boilers used were of the ordinary deep firebox type, one being tested as usually built, and the other having the sides and back of the firebox covered with firebrick, the tubes being lengthened so as to give approximately the same total area of heating surface. The most important dimensions of these boilers are as follows:

	Ordinary boiler.	Boiler having lined firebox.
Number of tubes.....	150	150
Length of tubes.....	10 ft. 1.4 in.	11 ft. 3.8 in.
Diameter of tubes, inside.....	1.8 in.	1.8 in.
Heating surface, firebox.....	71.7 sq. ft.	29.4 sq. ft.
" " tubes.....	718.5 sq. ft.	894.8 sq. ft.
" " total.....	790.2 sq. ft.	924.2 sq. ft.
Area of grate.....	13.7 sq. ft.	13.7 sq. ft.
Depth of firebox to grate.....	46.6 in.	43.6 in.

The following table contains the results of tests of the two boilers:

Vacuum in the smokebox, in. of water.	Pounds of water evaporated per hour at a pressure of 54 lbs.		Lbs. of coal burned per hour.		Lbs. of water evaporated per lb. of coal.		Temperatures in the smokebox, ° Fahr.	
	Plain firebox, A.	Lined firebox, B.	A.	B.	A.	B.	A.	B.
8.1	3,080.	3,390.	411.3	457.5	7.31	7.35	590.	590.
13.6	3,574.	4,294.	545.6	585.7	7.10	7.22	602.	608.
18.8	5,254.	5,369.	732.4	741.4	7.08	7.24	708.	692.
26.8	6,380.	6,534.	897.5	898.8	7.11	7.39	879.	896.
(50 mm.)								

New Automatic Hollow Chisel Mortising Machine.

This new and radically novel machine is particularly designed for mortising and framing long car timbers, such as side sills, top plates, stringers, etc., and is being used for gaining, boxing, end-tenoning, etc., or as a routing machine, as well as mortising. On account of the use of stops on the carriage in connection with the foot treadle there is little if any need of laying out the timbers before putting them in the machine.

The range of stroke is 16 ins., and can be regulated by stops to any position or length. The shorter the stroke, the quicker in proportion is the reverse of the tool plunger.

The tool frame has a transverse horizontal adjustment of 12 ins., movable to stops by the vertical hand wheel. The carriage is framed of steel, light and strong, and has bed-rollers, adjustable eccentric clamps, etc. It is fed by power, using the vertical lever; or by hand, using the hand wheel. The carriage is made of any length from 10 to 60 ft. The range of working is from $\frac{1}{4}$ in. to 2 $\frac{1}{2}$ ins. A boring attachment is supplied with the machine, when desired.

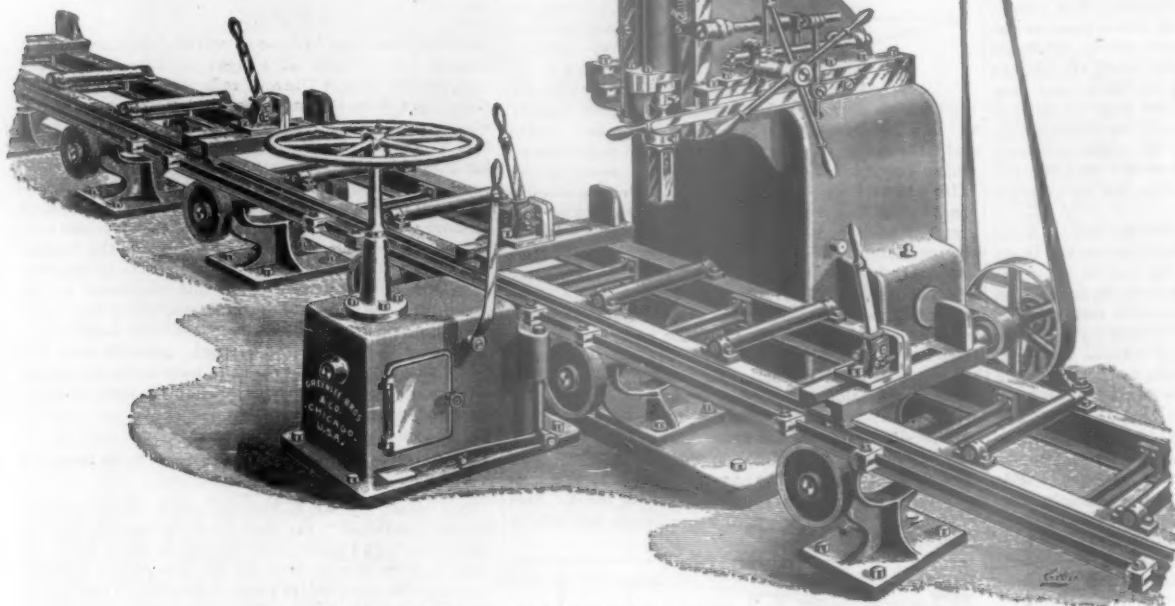
This machine is claimed by the designers to be very fast, powerful, handy to operate, and capable of doing perfect work. Further information can be obtained of the manufacturers, Greenlee Bros. & Co., Chicago, Ill.

Bridge Details.

At the December meeting of the Engineers' Society of Western Pennsylvania Mr. E. Swenson read a very valuable paper on "Bridge Details." We give below extracts from it and from the discussion, and regret that we cannot spare space for the whole paper:

General.—Taking up the subject in general, I find four laws governing the construction of details which should always be borne in mind by the detailing engineer.

1. The detail, connecting a member to the rest of the structure, should always be capable of developing the full strength of the member.
2. The detail, connecting a member to the rest of the structure, should transmit the strain by the most direct route.



NO. 7 AUTOMATIC HOLLOW CHISEL WORKING MACHINE.

Designed and Manufactured by GREENLEE BROS. & CO., Chicago, U. S. A.

3. The detail, connecting a member to the rest of the structure, should transmit the strain to the body of the member gradually, by way of easy and graceful curves.
4. The detail, connecting a member to the rest of the structure, should not produce any eccentric and undue strains on any member.

These laws have been, and are always, more or less ginned against by detailing engineers, but vastly more so in the past than at the present day. . . .

Tension Members.—When transmitting the strain into tension members in pin-connected bridges, the bar-head and the loop-eye are the usual forms employed. The bar-head, according to the practice of to-day, should have an excess of material over the body of the bar of from at least 30 to 50 per cent., so as to insure the breaking of the bar in the body instead of in the head. The relation of size of pin to width of bar is of great importance when determining excess of material in head, as is also its shape. If the pin is much smaller than the width of the bar, then it acts as a wedge, and the head should be elongated at the back, and have a large percentage of excess; if the pin is much larger than the width of bar, then bearing comes largely into play, and the bar does not need to have such a large excess of material, but should have a long neck, so as to transmit the strain gradually, and by easy curves. If the excess of material in the head over the body of the bar is 50 per cent., and the head is concentric with the pin, and the

neck has a curve, whose radius is equal to the diameter of the head, then the size of the pin should not be less than 90 per cent. of the width of the bar. . . .

The tension members in riveted structures must, necessarily, have as much larger area as is cut out by the first rivets connecting the member, which, with the best arrangement, may be reduced to one rivet. An arrangement of rivets connecting tension members in such manner that more section is cut out of member than provided for, is often noticed in detailing of riveted structures.

Pins.—Truss pins, the principal strain-transmitters in American bridges, should be made sufficiently large to take the shear, bearing and bending, from the different members connected by means of them. If large enough to sustain bearing and bending from the different members, they are always large enough for the shearing strains, and, if members are successfully packed on the pin, the bending produced by this packing will often give a smaller pin than the bearing of an eye-bar in this packing will do. . . . In packing of eye bars on pins the divergence of any one bar from centre line of truss must not be greater than one per cent. of its length without bending of heads parallel to centre line. In the early

The jaw or cheek plate is a valuable addition to the hip joint adopted by later years' practice in preventing displacement caused by sudden jars or shocks of post and chord from their relative positions on pins, as well as being of use in erection. These jaw plates should be put both on the chord and post, inside on the one and outside on the other; of course, they may be counted as part of bearing. A cap plate is nowadays generally used to cover up top of joint, as well as splice bars in bottom flange at this point. . . . Straight chord joints, which are now usually kept off the pin centres, but made as near as possible to pin and on side toward ends of bridge, are detailed for transmission of strains by bearing only, and are simply spliced sufficiently to hold the parts firmly together. This rule is, however, very elastic, and splices are often found that are rather weak to take care of any severe shocks which may come upon them. Some specifications call for fully spliced joints in compression as well as tension members and place no reliance upon abutting joints.

A common mistake in designing this detail is made by making the web splice-plate and tin-plate in one piece, or making the cover plate do as splice-plate also, or again, if top of chord is latticed, to make the long-tie-plate over pin act as splice-plate too. In the first case, web splice and pin-plate must be left off when facing the end of chord, then sent back to the riveters for riveting on of these plates, and again returned to the machine shop for boring pin holes; in the second or third case, the whole cover-plate or long tie-plate must be left off when facing the end of chord. That these proceedings are not very economical can readily be seen. . . . As regards size of tie-plates and lattice opinions seem to be rather divided. Most specifications call for a width of tie-plates at ends of compression members equal to one and one-half, two, or two and one-half times the width of the member; but what this width is is rather indefinite. It is also doubtful whether compression member means the whole top chord or each panel piece of chord. As good a rule as any for size of tie-plates is, probably, the following: Make tie-plates at extreme ends of compression members as nearly square as possible, and at intermediate points about half that length, the exact length being determined to suit rivet spacing, etc. . . .

Intermediate Posts.—The designing of ends of intermediate posts, of sufficient strength to transmit the strain on the post, is one of the most difficult problems the detail engineer has to solve, because the size and packing of everything else in the truss has already been determined upon before the width of posts is considered. . . . Usually, the flanges

must be cut away altogether, and, sometimes, the web has to go also, and nothing is left to do but to transmit all the strain by means of the pin-plates. Of course, when this latter is done, the stiffness of unsupported flat bars in compression must be duly considered. When flanges are cut away the cut must be finished on a 45-degree angle, beginning with a gentle curve, or the post is very liable to split up at this point. The pin-plates must be long enough to pass the edge of the tie-plate by at least 3 in., and preferably more, depending upon how much the flange has been cut away.

When floor beams are riveted to a channel post, the channels should be connected by means of a diaphragm, sufficiently strong to carry over half the floor-beam reaction into the outer channel, or, in other words, make both sides of posts act in unison, tie-plates and lattice not being able to perform this duty. Of course, this lattice work is not necessary opposite the diaphragm. . . .

Stiff Lower Chord.—Frequently specifications require the two end panels of lower chord to be made stiff members, which is either done by latticing the eyebars, or by building up the member of plate and angles or channels. A rather difficult task is so to pack lower chord and arrange shoe, that the latticed eyebars become parallel. If a satisfactory mechanical, as well as economical connection of floor beam or strut and lateral can be made at intersection of suspender and lower chord, without having a pin at that point, it is preferable

to make eyebars in one piece over the two end panels. This is, however, a decidedly difficult problem to solve, and it is doubtful if it has yet been satisfactorily detailed.

End Shoe, Expansion Rollers and Bed Plate.—Two of the most noticeable discrepancies in past detailing of end shoes is the omission of the pin connection and making the height of shoe in pin connected shoes too great for the length of its base. The omission of pin connection prevents the shoe from adjusting itself to an even bearing on the masonry and produces bending strains in truss members when the truss deflects under load. Of course the pin connection should be so constructed that end post and shoe can move freely through a small angle; if post-bearing is wholly or in part directly over shoe bearing, then an open joint must be made to per-

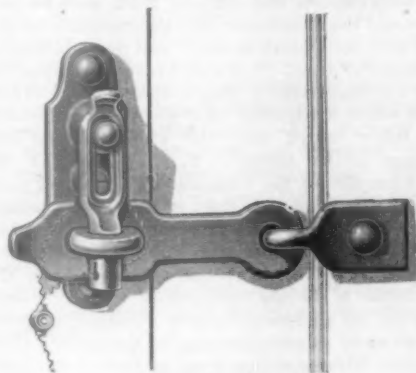


Fig. 2.

mit of this movement. As at the hip joint both shoe and post, or at least post, should have jaw or check plates to guard against side displacement.

As regards rollers, good practice of to-day demands that they should be made into a nest, with guide-bars holding them in a fixed relative position, and stay-rods keeping the guide-bars a fixed distance apart. These stay-rods are often made of angle iron, so set and planed that they also do service as dust-angles; the guide bars together with half T-irons, riveted to shoe and masonry plate and fitted in between shoulders on rollers and guide bars from the dust protection on the sides. Instead of this latter construction an angle is often in small spans riveted to the masonry plate outside of guide bars for dust protection. The half T-iron construction is a much used and very satisfactory detail for holding the roller nest in its true position laterally. For short spans it is sufficient to plane the sole and masonry plates down one-eighth of an inch to receive the rollers, in addition to the angle on masonry plate, to keep the roller nest in position.

In the groove and tongue device, so much used to hold the roller nest in true lateral position, particular care should be taken that the depth of tongue is less than depth of groove, as otherwise the bearing will be concentrated on the tongue and groove with the probability of breaking the rollers.

Floor Beams.—Whenever possible, floor-beams should be rigidly attached to posts or their extensions, strength of connection being made from 25 to 50 per cent. in excess of that due to load. Their connection is either made by making the floor-beam web part of post-web, or by angles connecting floor-beam web to inside post-web; which is connected to outside web by means of a diaphragm. The former mode of connecting floor beam to post, which can only be used when post has one web and then at right angles to chord, is without doubt the best detail used for this purpose, as rivets in joint are in double shear, but it is very troublesome connection in the erection, especially if post web is not made a trifle thicker than floor beam web. . . . Faulty detailing of floor beam connections, especially in using the loop hanger construction, has in all probability caused more bridge failures than any other detail in truss. A construction very much used in past practice is two rods at each end of beam bent around pin, and straddling beams extending through flange angles or a plate under flanges. In either case floor beams are supported on nuts with or without check nuts, but without end stiffeners on floor beams and relying altogether upon the stiffness of root in flange angles. This is beyond question a seriously weak construction and should be prohibited in all railroad bridges and highway bridges with long panels. . . . A faulty construction met with in floor beams, especially shallow beams, is insufficiency of number of rivets between points of support and application of load. This, however, cannot always be laid to the detailer, as it is often impossible to get in the required amount of rivets, and can only be remedied by designing a thicker web or flange angles with longer legs.

Stringers.—Stringers, when resting on top of floor beams, should be spliced over beams, have stiffeners over beams of sufficient strength to transmit stringer end reaction, and be braced sideways to beams. When riveted to web of beams, strength of connection should be 25 to 50 per cent. in excess of that due to load. A shelf or bracket on floor beam should be provided as a valuable assistant in erection. If top flange of stringer is narrow it must be braced laterally against transverse crippling.

Formerly, length of stringers riveted between floor beams was made $\frac{1}{8}$ in. shorter than their geometrical length to facilitate erection; but under full load tension would then come on the rivet heads, to avoid which their length is nowadays made to the chord length under full load. This will of course cause trouble in erection, particularly in long spans, but may to some extent be remedied by so constructing the span that the trusses can be swung off the false work before putting in the stringers. To overcome this trouble altogether, each panel of stringers may be treated as an independent plate girder span, only resting upon well stiffened brackets on floor-beams, serving as piers for said spans. When so treated, stringers should be well braced laterally.

Laterals and Sway Bracing.—As regards top laterals, with their struts, in through bridges; the best construction is, in all probability, to make the strut of same depth as chord and attach same rigidly to top and bottom flanges of chord and connect laterals to top flange, in short spans, and to both top and bottom flange in long spans, using double laterals of course; taking care to always get double shear on lateral pin by using two plates and plain loop; or single plate and forked loop or clevis. Knee braces, rigidly connecting struts to posts, should be used, and, when depth of truss permits, full sway-bracing, instead of knee braces, should be used. To make knee braces, or sway-bracing, thoroughly effective, posts should be packed tight in chord. This is very often neglected. Top laterals and sway rods are often connected directly to pins by means of wing plates, but

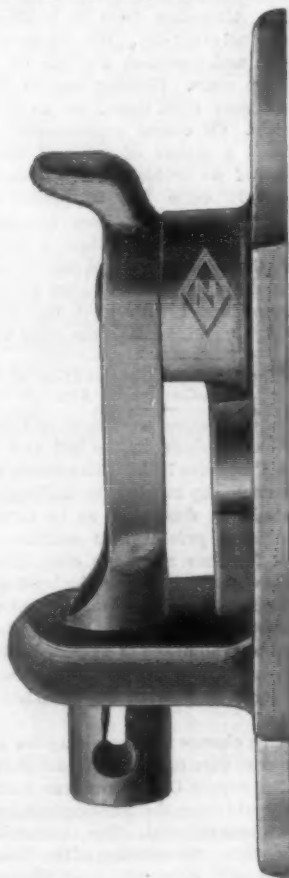


Fig. 1—Car Door Fastener.

this should be avoided, unless the struts also are connected directly to pins by means of U-nuts. Portal bracing in through spans, should never, except in very short spans, be connected to web of end post. . . . If depth of truss permits, one upper and one lower strut, connected by rods, should be used, or in long spans, with bracing under heavy strains; these struts should be box shaped, of same depth as post, and connected to both top and bottom flange with double rods, one set in each plane. . . . A faulty detail, very often met with in long spans, is the neglect to provide extra section in post to take care of the portal strain after it has entered the post.

Lower lateral bracing in through bridges should be so designed and detailed, that the bending on floor beams and posts is reduced to a minimum. Thus their connections should be so arranged that the strains in laterals go directly to the centre of truss pins, both in vertical and horizontal planes, and the flange of floor beam be on line with centre line of pin, preferably the lower flange, which, of course, calls for floor beams riveted to posts. . . . Lower lateral bracing in deck bridges is best detailed by connecting struts to pins by means of U-plates and rods with wing plates, also on pins, behind U-nuts. Rods may also be connected to small pins which, in turn, connect struts to U-nuts.

Sway rods in deck bridges are best connected to the extended tie plates of top and bottom struts. Another connection somewhat inferior, which frequently is used, is by wing-plates to chord pins behind strut U-nut connection or by bent plate to cover plate of top chord, when floor beams serve as top struts.

DISCUSSION.

Mr. ROBERTS: It is one of the most valuable papers we have ever had read before our society. I believe it will become standard in the matter of details.

Mr. M. J. BECKER: I would like to ask Mr. Swenson one question with reference to an occurrence that happened to one of our bridges about a year ago. The bottom chord was pinned together with a steel pin, I think, 5 in. in diameter, reduced at the ends to a diameter of about 3 in. with a screw thread cut on for the purpose of receiving the pilot nut. Upon this reduced diameter on which the screw thread was cut there was a so-called U-plate attached on the inside of the chord, which again held the lateral strut. Before the bridge was up a week, and before it had been properly adjusted, the reduced end of that steel pin broke bodily off. I never could understand quite fully what could have induced that break. It was Bessemer steel, filling the specifications. The fracture was a very clean break, and right at the reduction from the large to the small diameter. My idea, and the only explanation that I could give was that when the pilot nut was put on some violence was used in driving the pin, starting the fracture. There might have been some slant blow given, but I was told that the pin was driven from the other end.

Mr. LEWIS: It may be that this break was induced by turning down squarely to a sharp corner without a fillet.

Mr. BECKER: It was cut down to a sharp corner.

Mr. SCAIFE: I noticed a case not long ago which may bear somewhat on this point. We had some 1½-in. steel bolts, to be used for bridge work, and, in putting together the work, had occasion to draw up very hard on one of these bolts. The bolt was broken off at one of the threads, simply by the strain put by a couple of men on a long wrench. The fracture was perfectly clean and showed good steel. It seems to me, from this and other cases I have noticed, that steel is not a good material to use for bolts where the strain may be brought on a sharp edge or shoulder.

Mr. SWENSON: There is one point I would like to call attention to. . . . We are spending money all the time to prevent things from getting worse and making them do a little longer; in other words, remedying some of those manifest clumsy mistakes that were made in the past. We generally find a way to get over it, and to make the structures last a little while longer. I will mention, for instance, this question of floor-beam hangers on pin-yokes. . . . When the floor-beams are a little weak, as they probably are in old bridges, they will go down under the load. Now I do not know what else you would put in such a bridge and hold these floor-beams up. If you don't are you going to throw the whole bridge in the scrap pile?

Mr. SWENSON: . . . To remedy such things as floor-beam hangers is not so very difficult. Get new floor-beams and put in plate hangers from the middle of pin.

(Continued on page 160.)

New Car Door Fastener.

The engravings herewith show a car door fastener recently patented and put on the market by the National Malleable Castings Co., of Cleveland, O. The essential feature of the device is the method of fastening the pin to the plate which holds the staple, so that the pin cannot get lost. As will be seen from fig. 2 this is effected

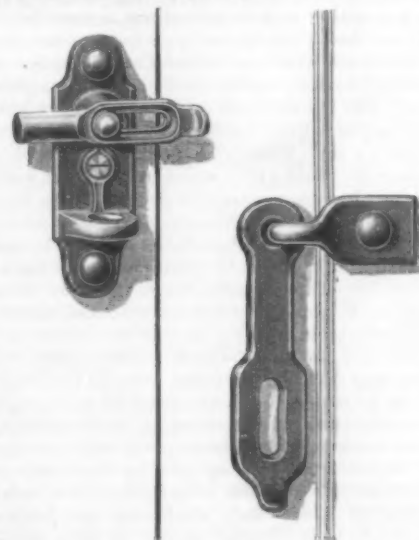


Fig. 3.

by means of a slot in the upper end of the pin. The pin is fastened to the plate by the rivet which engages the slot, while at the same time it has sufficient vertical motion to enable it to fulfill its function. The dimensions of the parts and the size of the bolt are uniform with those of the standard fastener heretofore made by the same manufacturers, so that the substitution of this for the old form is easily effected. It will be seen that each fastener is complete in two parts. Fig. 3 shows the position of the pin after opening the hasp.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in his journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Steel Ties and 100-lb. Rails.

We noted briefly last week the interesting fact that the New York Central & Hudson River Railroad will put down 100-lb. rails on steel ties on the four tracks from Grand Central station yard to Mott Haven junction. Two miles of this distance is in tunnel and 2½ miles in open cutting with retaining walls, or on viaduct. At first thought one would say that a tunnel was about the last place to get the economy of metal ties because corrosion would reduce their life much below the normal. The life of a wooden tie would not be shortened in a tunnel nearly in the same ratio that the life of a metal tie would be reduced. With regard to corrosion, however, it should be added that the steel ties now being laid there are treated by the Angus Smith process, with coal pitch varnish and linseed oil at 300 deg. F. One of the ties so treated was taken out of the track at Garrison's, after having been down 2½ years, and showed no indication of rust or corrosion.

But the New York Central case is a special one. The four tracks from the Grand Central station to Mott Haven carry the concentrated traffic of two great railroads, into and out of the third city of the world. Over these tracks there are about 500 train and engine movements a day. With such a traffic the determining element in the life of a tie is its capacity to resist wear rather than its endurance against decay. On the New York Division of the Pennsylvania, for example, where an intense traffic is borne by oak ties in stone ballast a rotten tie must seldom be taken out of the track. It is worn out before it has time to rot. The New York Central case is a similar one with further complications. It is probable that the ruling element there is not one of tie economy; but that the most important factor is the cost and difficulty of doing work on the track. There are, as we have said, about 500 movements a day through this narrow throat, or, on the average, less than three minutes between each engine movement. Added to this, there is scarcely room for refuge beside the tracks; much less, room for hand-cars, tools, and material. Under such conditions, considerable money can be spent profitably merely to keep workmen off the track. With 100-lb. rails, on steel ties, in stone ballast, thoroughly drained, it may be expected that the work of surfacing, lining and renewals will be reduced to the minimum that can be reached in present practice. The work of the trackmen ought to be reduced to watching the fastenings and looking for broken rails. It was found that in the year 1891 the cost of labor in maintenance, on the experimental section of 800 steel ties put down in January, 1890, was but 8½ cents per tie.

Considering, then, the difficulties of working in the narrow limits of a tunnel, in the dark, and with incessant traffic, it is decided to reconstruct the track so as to make it really permanent way. This work is now going on at night, between 9:15 p. m. and 6 a. m. The old ballast is excavated and the sub-grade lowered 3 ins. to allow for the higher rail and give a little more head room. The new sub-grade is sloped to drain into three 10-in. pipes, which discharge by silt basins, trapped into the city sewers. On the road bed so prepared 12 ins. of broken stone ballast is laid. In this the steel ties are bedded, carrying the 100-lb. rails, 6 ins. high. The fastenings are by ½-in. bolts and clip washers 3 ins. broad.

The economic results cannot be determined for some years, but probably the theory will be justified by the practice. If it is there are other places about New York where the same course will, perhaps, be taken for the same reasons. For instance, the Bergen tunnel of the Erie is about 4,388 ft. long, double tracked. Through this tunnel are carried the passenger and freight trains of the main line, including a heavy suburban business, and the trains of four other roads with a large suburban traffic. Just west of the tunnel are the principal roundhouse and an important freight yard of the eastern terminus of the Erie, so that through the tunnel there is a considerable movement of light engines and empty cars, added to the heavy traffic movement. Altogether from 325 to 350 engines go through the tunnel every day. It is not surprising that between wear and corrosion the life of a rail is less than three years. Nothing heavier than 74-lb. rails has yet been tried there, but an 80-lb. rail is now being laid. Of course maintenance is difficult and costly, and a matter of constant anxiety; but we remember of no accident there from defects of track. Certainly none has happened in recent years, but they have only been avoided by incessant care and expense. This, then, is another situation in which the most costly track may be the cheapest. Why would it not be a good plan to lay 100-lb. rails through the tunnel, with steel ties one-half its length and oak ties and tie plates the other half?

Changes in the Text and Construction of the Interstate Commerce Act.

The Senate Committee on Interstate Commerce is giving a series of hearings on the bill now before it known as the Procedure Bill. This amends the Act to Regulate Commerce by making the findings of the Interstate Commission conclusive as to facts. These findings are now *prima facie* evidence; that is, the courts of law can retry the case, although the decision of the Commission shifts the burden of proof to the appellant railroad company. Under the proposed law the Court could judge of the record—whether testimony had been admitted or excluded wrongfully, for example—and could remand the case to the Commission for a new trial, but could not retry the case itself.

Against such a change in the existing law a number of able arguments were made by the attorneys of the railroads. The Senate Committee was warned that the railroads would carry the constitutionality of such a law to the highest tribunal. The Commission is not a court of law within the meaning of the Constitution, but a legislative body whose acts must always be subject to appeal, no matter how the act should be amended. Besides that objection, it was argued that the proposed bill is against natural justice, since the Interstate Law now makes the Commission a quasi-judicial and at the same time a prosecuting body, these being opposing functions, incompatible with perfect fairness of mind.

To these arguments the Commissioners replied that they wanted no more power than was necessary to carry out the purposes for which the Commission was created, and that any amendment answering this intent would be gladly accepted. They further claimed that the railroads were showing a more decided inclination to ignore the orders of the Commission and to await trial before the Circuit Court. Such a disposition the Commissioners thought might be carried so far as to amount to a denial of justice on the part of powerful corporations who had money and time to defeat any finding that the Commission might make. To this the railroad attorneys answered that their companies had not refused to obey the Commission in ninety-nine cases out of a hundred, but in the hundredth case, where they thought the Commission was wrong, they wanted their legal right of appeal; and that in the nature of the case the railroads could not know what the real issue was until the Commission had rendered a decision, a decision which might go far beyond the pleadings of that particular case.

It may be well to go back of these legal objections to

any bill making the findings of the Commission conclusive, to look for a moment at one of the reasons which seem to be forcing the railroads unwillingly into an attitude of apparent hostility to the Commission. It is admitted by the Commission that the disposition to disobey its orders has only lately been apparent, and this disposition is supposed to arise largely from pure intolerance of governmental interference; but is there no other reason?

It has for a year or more been apparent to quiet observers that the kind of cases brought before the Commission has been changing. In the years following the creation of the Commission in 1887, that body was called upon to decide matters of discrimination, or rather, of regulation. Lately, however, the complainants have claimed that railroad rates were too high *per se* and the Commission has undertaken to fix and determine such rates absolutely and not relatively as in the earlier years. That body has therefore departed from the comparatively simple theory about its own duties which it originally held and in later decisions has boldly stated that the whole railroad field is open to its power. This extension of the first conception of the Commission's power and place may be dated from the order of June, 1890, wherein the Commission undertook to say what the rate on corn should be from trans-Missouri points to Chicago and from Chicago to the seaboard. From the very nature of the case the fixing of such rates—not relatively but absolutely—must be a commercial question which by no possibility can be determined theoretically. There is and there can be no legal standard. Indeed, we can ascertain the limit of profit more easily in sales of meat and bread than in sales of transportation, for the elements are simpler in the former case.

At a recent Senate hearing, as an example of the refusal of carriers to obey the Commission, the case of the rate on oranges from Florida to New York was cited. The old rate by water lines was 30 cents per box; this was advanced by the carriers to 40 cents. The Commission declared 40 cents unreasonable, but fixed upon 35 cents as fair, with a proportionately higher rate for the all-rail lines. An examination of the text of the decision shows a very queer line of reasoning. A large part of the report is taken up with tables of the average rates on Southern roads per ton per mile, though averages have or ought to have no bearing upon the question of a proper charge upon a particular product carried by fast trains under exceptional conditions. Then we have the figures of the Commission's statistician, purporting to give the average cost of carrying freight. As is well known these averages of cost are obtained by allotting the unclassified expenses to the passenger and freight departments according to the train mileage of each. The results are of course absolutely worthless for use in the case in question. Rather than give to these theoretical computations of the statistician the effect of evidence (and the Procedure Bill would make them so) it would be better to abolish the office altogether.

Besides this objection to averages, the decision itself names a number of others, in the shape of unusual expenses incurred by the carriers for the quick despatch of fruit. It is stated, for example, that "pier 29, the *shedding* of which cost the Pennsylvania Company \$45,000, is devoted exclusively to the perishable traffic, and consignees use it as their salesroom without charge. . . . The ocean steamship company has set aside one-half of one of its piers in New York, rented at from \$40,000 to \$45,000 per annum, for the special care of oranges, and steam has been introduced so as to keep them warm in cold weather. . . . At Wilmington a special yard for perishables was constructed two seasons ago at a cost of \$15,000 to \$18,000, and at Richmond the loads have just completed a track around the city at a cost of \$150,000." These quotations seem to dispose of the doctrine of averages as far as the orange rate is concerned. Even the Commission says "No definite and reliable data are furnished as to the actual cost to the carrier of the orange traffic."

Then the Commission attempts to go into the question of profit. Comparisons of no value whatever are drawn between oranges and cotton. The theoretical cost to the grower of Florida oranges is about 60 cents for packing and 30 cents for growing; these, with 10 cents commission and 40 cents freight, about make up the average selling price. Yet the freight charge is only one minor factor among important ones which determine the selling price, supply and demand being the most important of all. The product of Florida is increasing faster than the public taste for oranges, the crop the present winter being double that of 1889-90. The selling price per box has consequently fallen from \$2 to \$1.50. It is the large supply and the general prosperity of the mass of the people (who stop eating

oranges in hard times) which fix the selling price of that fruit and the consequent price to the grower. As orchards increase in productiveness, the profit per acre may be the same to the grower though the price per box decline. In all these conflicting commercial forces, the part which the freight rate plays is relatively small, cannot be ascertained theoretically in any case, and indeed varies from day to day.

To say that 40 cents per box on oranges carried by special trains 1,000 miles from Florida to New York City is unreasonable while 35 cents is fair, is simply to make guesswork of the case. Railroads are scarcely to be blamed if they prefer their own guessing. More than that it is stated about the Savannah, Florida & Western, a road blamed for high rates in the report, that it "has not paid dividends for some time."

We have given this case at some length as typical of a difficulty which railroad managers feel in dealing with the new claims of the Commission, however much they would like to keep in touch with it as representing public opinion. The Interstate Law does not say that the Commission shall "fix and determine" rates, but that it shall enforce "reasonableness." This is not a fanciful distinction; reasonableness is a relative question, a matter of regulation. It means that towns or persons shall be treated alike under similar circumstances, but cannot rightly be construed to cover fixing rates *per se*, which is and must always be a question of commercial profit and beyond theoretical determination.

The Latest Brake Tests.

In another column will be found the results of some tests made with the New York and the Westinghouse air brakes on the Lehigh Valley Railroad last week. The comparison of the length of the stops is given in what follows, together with a summary showing how they compare with stops computed by the formula based on previous experience, which was explained in our last issue. Of course, the graduation tests could not be made with new brakes to show what the results would be after considerable service. This is true also of the tests made to show how the valves would hold the pressures in the cylinders going down grade. The most interesting of the results are the records of the release, which appear in the official report printed on another page.

tween these stops and those made at Burlington recently and by the Westinghouse exhibition train in 1887 must be found in the difference in the leverage of the foundation brake gear, or in the material in the brake shoes, or in the fitting of the shoes to the wheels, or in some combination of these elements. It was quite noticeable that the train did not stop as rapidly as at Burlington. The shoes and wheels were new and the contact was not so perfect as if they had been worn together, but was very good for new work. The material of the shoes was quite hard. From the records it appears that there is little danger of skidding the wheels when the shoes are as hard as those used in these tests unless the pressure on them is increased.

The factor, .38^s, which was given in the *Railroad Gazette* last week in the formula for the length of stops when the emergency brake is used, is the only one which is affected by a change in the material, or fitting of brake shoes, or a change in per cent. of braking power. To suit the results of these tests it would have to be made .38^s, .42^s, .46^s and .57^s, respectively for the different speeds. With a hard brake shoe the braking power seems to decrease as the speed increases.

We referred last week to the necessity of a consideration of the distance in which a train can be stopped from such speeds as 90 miles per hour, and it is now evident from these last tests that only the softest kinds of cast iron should be used for the brake shoes on the steel tired wheels of trains to be run at such speeds, and they must be well fitted. Of course, a hard shoe will wear longer, but that is a minor matter compared to the increased safety to passenger trains derived from the use of a soft shoe.

Legality of the Reading Leases.

The legality of the new coal combination is questioned, and Mr. A. J. Cassatt has submitted to Governor Pattison, of Pennsylvania, a statement of the facts as reported and a map showing the coal regions and the railroad lines by which the several companies in the combination reach them and carry their product to the principal markets. He declares that they are competing lines, the union of which is prohibited by the constitution of Pennsylvania. Governor Pattison submitted this to the Attorney General, who has

greater than it has had heretofore. They seem to have been inspired with the belief that the rates for transportation will be made more nearly in proportion to the distance carried than they have been. They claim that New York has been able to get coal at very nearly the same prices as Philadelphia, and that with the promised change in rates Pennsylvania manufacturers will have a great advantage over those of other parts of the country which use anthracite coal; and this is given as a reason why the state authorities should look favorably on the new arrangement. Why it should require a new combination to secure such a change, if it is generally advantageous to the coal-carriers or fair to customers, or what security there is for maintaining such change, if made, does not appear; and it is not probable that even if it were secured it would affect Governor Patterson's action in enforcing the observation of the state constitution should he believe it to be violated.

Doubtless coal rates, like other rates, are not in proportion to distance. It is with a coarse freight like coal that is soonest felt that fundamental limitation of rates—the value of the transportation. At anything more than a very low rate per mile, the transportation of coal for a few hundred miles even, becomes impossible in most parts of this country, and with a very low rate per mile for all their coal, most of the anthracite roads would become bankrupt. They cannot charge more than they can get, and usually they have to charge pretty much all they can get; and this remains true when the roads are united. Any such change in rates as would destroy established industries in one part of the country in favor of those in another part would come to grief in short order. Moreover, it is decidedly against the interests of the railroads to have the coal consumed close to the mines. They earn money by carrying, and the four lines to New York and the two to Buffalo cannot be made to pay by sending all the coal to Philadelphia.

It is probable enough that the state of Pennsylvania has little to apprehend from the proposed combination; there are other limitations than any the railroads can impose on the price of anthracite coal to the consumers, and they can prosper only by mining, carrying and selling immense quantities of it. There is probably less to be feared by consumers, as well as less to be hoped by coal proprietors and carriers from the operation of the combination than the public is given to understand by most of those who discuss it.

STOPS MADE ON THE LEHIGH VALLEY RAILROAD, BETWEEN PATTERBURG AND CLINTON, GOING EAST; GRADE 0.9%, DESCENDING.

	A	B	C	D	E	F	G	H	I	J	K	L	M
N. Y. B.	20	232 1/2	70	14.26	2.09	29.3	56.6	174	151.7	14.7	151.7	151.7	210.3
"	41	1,181	67	90.90	10.63	60.1	120.2	1,048	901.4	17.7	858	801	688.3
"	32	683	68 1/2	36.55	5.97	46.9	93.8	580	480.2	16.3	430	431	500.9
"	25 1/2	407	70	23.74	3.66	37.8	75.6	331	288.8	15.4	292.5	202.5	368.7
W. A. B.	20	232 1/2	71	14.26	2.03	29.3	58.6	167	146.2	14.2	146.2	148.3	306.9
"	41 1/2	1,128 1/2	71	61.61	10.15	60.9	121.8	1,007	864.4	16.5	803	814.2	931.5
"	30	590 1/2	71	32.16	5.04	44.0	88.0	472.5	408.4	15.7	408.4	414.2	502.2
"	21	383	72	20.35	2.97	35.2	70.4	253	220.8	14.6	220.8	206.6	342.8
N. Y. B.	31	384	70	15.76	2.29	30.8	61.6	182	167.8	14.5	152.2	152.2	210.8
"	40 1/2	1,036	71	58.61	9.50	59.4	118.8	937	806.2	16.2	786.4	797.6	914.9
"	34	713 1/2	71	41.37	6.43	49.9	90.8	615	532.5	15.5	414.5	430.4	508.4
"	28	674	71	38.47	4.27	41.4	82.8	391	340	15.0	293.2	297.4	373.6
"	21	346 1/2	77	15.76	2.21	30.8	61.6	185	169.3	14.0	147.2	162.0	220.6
"	41 1/2	1,070	70	61.61	9.68	60.9	121.8	954	824.5	15.7	776	796	883.3
"	31 1/2	657 1/2	72 1/2	42.33	5.92	50.6	101.2	556	486.2	13.9	360.1	382.3	470.3
"	28 1/2	400 1/2	72	29.03	4.14	41.8	83.6	377	329.8	14.3	274.5	282.3	358.5

A—Speed miles per hour.

B—Length of stop—feet.

C—Train pipe pressure—pounds.

D—Stored energy per pound of weight—foot pounds.

E—Stored energy due to grade—foot pounds.

F—Velocity—feet per second.

G—Distance run before brakes apply.

H—Distance run after brakes apply.

I—Distance run after brakes apply reduced to a level.

J—Correction due to grade—per cent.

K—Distance run after brakes apply reduced to 20, 30, 40 and 60 miles per hour.

L—Column K equated for train pipe pressure.

M—Final equated stops.

Comparison of stops on 47 ft. grade reduced to uniform speed and a level track. 20 miles per hour.

	Computed stops. Ft.	Equated actual stops. Ft.
New York air brakes, new shoes, first trial...	178.7	210.3
Westinghouse air brakes, new shoes, first trial...	178.7	206.9
New York air brake, shoes better fitted, second trial...	178.7	210.8
New York air brake, shoes still better fitted, third trial...	178.7	230.6
35 miles per hour.		
New York air brakes, new shoes, first trial...	279.	308.7
Westinghouse air brakes, new shoes, first trial...	279.	342.7
New York air brake, shoes better fitted, second trial...	279.	373.6
New York air brake, shoes still better fitted, third trial...	279.	358.5
30 Miles per hour.		
New York air brakes, new shoes, first trial...	358.	300.0
Westinghouse air brakes, " " " " " " " "	358.	302.2
New York air brake, shoes better fitted, second trial...	358.	508.4
New York air brake, shoes still better fitted, third trial...	358.	470.3
40 Miles per hour.		
New York air brakes, new shoes, first trial...	507.	638.3
Westinghouse air brakes, " " " " " " " "	507.	601.5
New York air brake, shoes better fitted, second trial...	507.	914.9
New York air brake, shoes still better fitted, third trial...	507.	883.3

These stops are altogether too long for quick acting brakes. In this case there was sufficient pressure in the brake cylinders, and therefore the difference be-

called on the President of the Reading Company to submit copies of the agreements or leases complained of, and invited him to be represented at a conference March 3, at which the complainants are summoned to make their objections at length. The Attorney General in his communication to Mr. Cassatt says that he has been "instructed by the Governor to take such action as will enforce the constitution and bring all who have violated it within its control."

Naturally the Attorney-General is not willing to pronounce the Reading leases unconstitutional until he knows what they are; but the well known disposition of the Governor is to enforce strictly all limitations of the power of corporations. These constitutional limitations, of course, were considered by the lawyers who drew up the leases and without doubt they have endeavored to make a contract which will hold good in spite of them, and believe that they have succeeded. The unsuccessful attempt of the Pennsylvania a few years ago to escape from these constitutional limitations must have warned the Reading to proceed in a different manner.

Meanwhile the Philadelphia newspapers assert that one of the results of the combination is likely to be to give Philadelphia an advantage in the price of coal over New York and other seaboard and interior places

Exaggerated Reports of Fatalities at Chicago Crossings.

The city of Chicago has a large number of grade crossings and they are doubtless as dangerous as any city crossings anywhere in the world. Many people have been killed at them and it is highly important that the complicated and perplexing problem of removing the danger be constantly kept before the city and the railroads until a practical solution shall have been devised. But the fact that the evil is a great one furnishes no warrant for exaggerating it, and we are glad to see, by an article printed in the *Chicago Evening Journal* of Feb. 2, that the appalling statements published during the past year or two, to the effect that grade crossings are responsible for some four hundred deaths in Chicago yearly, are out of all proportion to the true facts; so much so, indeed, that they are grossly misleading. This deceptive claim has gained wide currency and has even been repeated, without contradiction, in the meetings of a technical society which ought to have set the matter right. Most of the citizens of Chicago, who give any definite thought to the subject, doubtless imagine the horrors of which they now and then read in the newspapers, such as the horse car fatality of a month ago, as occurring in all quarters of the city at the same time and as being suppressed by the newsgatherers; for if even 300 crossing accidents occurred in a year there would be half a dozen a week, and the slaughter of innocent citizens at that rate would call for emphatic attention from the press.

But even the *Journal* article does not show the whole truth at first glance, and we have therefore made some inquiries for the purpose of more fully explaining it. The headlines are well calculated to foster the feeling already existing that the danger is worse than it is. The article is a list of "over 300 killed on the tracks in 1891" and is an itemized statement embracing each case recorded by the coroner, as occurring on railroad tracks or premises, and it is evidently for the whole of Cook County, as numerous cases happened far outside the city limits. But the whole are included as occurring on "Chicago's railroad terminals," and grade crossings are held "largely responsible" for them.

Now, a very little examination of the statement itself entirely disproves the assertions and implications of the heading. There are 330 items and twenty roads are named. We have not followed up every item, and, indeed, that is not necessary, for any careful reader of the list will need no statistical analysis to illustrate the point we make; but a careful examination of the records

of some of the more important roads shows that what we present below is undoubtedly a fair sample of the character of the whole list.

One road appears in the list five times. These five persons were killed as follows: 1. Picking up coal on the company's premises. 2. Employé, in freight yard. 3. Boy climbed between standing cars, when by walking 30 ft. he could have gone around the train. 4. Brakeman, 22 miles out of the city. 5. Brakeman, 12 miles out. The third case was at a street crossing, but none of the others was near one. Another road appears in the list eight times, but the officers state that only six of the cases occurred in Chicago, and but two of these at crossings.

The ten cases on another road turn out as follows: 1. Cannot find on company's records. 2. Car repairer, at work. 3. Walking on track, 12 miles outside of city. 4. Crossing track at station, not near a street. 5. Fourteen miles out, not near a crossing. 6. Collision of freight trains. 7. Derailment, not near a crossing. 8. Twelve miles out, man jumped from train. 9. Man tried to board a moving train. 10. Tried to crawl under a slowly moving train. Not one of the ten occurred at a crossing.

Another road, out of a total of 40 fatal accidents in Cook County in 1891, had 31 cases of trespassers walking on tracks, climbing on trains, etc., and 12 of employés; but only three at grade crossings, and at least one of these was outside of Chicago. Another road appears in the list 12 times, but the manager informs us that only three fatalities occurred at grade crossings; whether in Chicago or elsewhere in Cook County he does not say.

The city limits of Chicago now include so much of "the open" that it is not worth while for our present purpose to try to analyze the *Journal's* list with precision, but there are named in it over forty towns or villages, indicating that the territory included in the present schemes for elevating or depressing tracks constitutes but a small proportion of that covered by the Coroner's list.

We publish this partial analysis for the benefit of our Chicago readers and to mitigate the very bad reputation which statements heretofore made, and published in Europe as well as all over this country, have given to American railroad managers and American municipalities. Though incomplete, its perspective is substantially correct. In many of the items in the list of 320 cases, the name of the road is not given, but there is no reason to doubt that the proportions, as shown in the railroad records, and here given, are fairly stated.

Every possible means should be taken to avoid accidents, even on private tracks like those of the stock yards and of the Illinois Steel Co. (where some of these cases occurred); the killing of trespassers anywhere on a railroad is deplorable, even though they be trespassers; railroads should be so located and run that lawless persons cannot climb upon moving cars or take any of the other numerous risks which seem to be so attractive; but the point to be emphasized just now is that Chicago is no worse and no better than hundreds of other places as regards these phases of the question.

If we assume that one-tenth of the *Journal's* victims were killed at crossings, and that two-thirds of this tenth—or 20—occurred at crossings within the thickly settled portion of the city, we shall very likely hit upon a very liberal estimate, and this is the true basis on which to calculate in attempting to cure the existing evils. It is time that the city (or the state) and the railroads had a joint commission appointed to tackle the crossing problem, and that commission will need the services of the wisest engineers and financiers; but such men will, of course, consider the facts as they are. This they can do, while still according full justice to every interest, even the weakest; for Chicago's crossing troubles ought to be ameliorated simply as a matter of economy and convenience, whether any one is killed or not.

The Grant Locomotive Works in Chicago are rapidly approaching completion. They will be ready to build locomotives late this spring. The steam has been turned on to the plant, and the line shafting will be in operation shortly. Mr. William H. Fenner, Jr., the President of the works, is now selecting the men to take charge of the different departments, and it is beyond question that the staff of the establishment promises to be the best that can be secured. The whole system of the works will be on an improved plan, based on the experience of similar establishments in this country and on Mr. Fenner's extensive experience in the past. It has been generally supposed that a large amount of old machinery would be put into these shops, but this is not the case, as a majority of all the tools will be new and of the most approved type. The works will be lighted by electricity, and electric motors will be used for driving the traveling cranes, transfer tables, etc. A new plan has been arranged for erecting engines which will give an unusually large output per foot of track in the erecting shops.

A recent issue of the *Pall Mall Gazette* contains a short article by Mr. T. C. Farrer on the "Fastest Train in the World." That is, of course, the Empire State express of the New York Central. Mr. Farrer will be remembered by our readers as the author (with Mr. Foxwell) of that valuable little book, "Express Trains—English and Foreign," published a couple of years ago, and is an authority on the subject. He compares the

Empire State express with the East and West Coast Scotch expresses as the only long-distance trains in the world which approach it. The figures are:

New York Central; four stops; weight of train, excluding engine, 160 to 185 gross tons; speed, excluding stops, 50.3, including stops, 50.12; distance, 430½ miles.

West Coast; eight stops; weight, excluding engine, 80 to 130 gross tons; speed, excluding stops, 49.54, including stops, 45.76; distance, 450 miles.

East Coast; seven stops; weight, excluding engine, about 130 gross tons; speed, excluding stops, 48.15, including stops, 44.27; distance, 430 miles.

The fastest trains on the Continent of Europe are between Hamburg and Berlin, 177 miles, which touch 10 miles an hour. Mr. Farrer says that the American train is run with but one engine, while the West Coast train beyond Preston (200 miles from London) "generally has two engines." He suggests that one of the great English companies should get an American engine and give it a fair trial.

The other day the rear car of a suburban train leaving Jersey City caught fire. The car had the usual double floor, which was probably filled in with shavings or excelsior or similar material. A new brake shoe had been put in just before leaving the station. The roughness of the shoe, with probably more or less molding sand adhering, caused an unusual number of sparks on applying the brakes. These sparks entered a joint between the under boards setting fire to the inside. Smoke was noticed by a passenger and soon a blaze started that rose into the car through the steam-cock holes in the floor, high enough to burn the under side of a seat. Some difficulty was met in reaching the fire, but by stopping at a low bridge where plenty of water was secured it was extinguished before doing serious damage, and a small stream of water from a can in the car kept it from relighting. We do not remember to have heard of such a case before, but this one is well authenticated, and under different conditions might have been pretty serious.

The heavy fogs of last night were most disastrous to railroad men here. The ——— road had two rear-end collisions on this division, and, while much property was destroyed, no lives were lost. On the ——— the employés were not so fortunate. A flagman failed to get his flag back to the proper distance and one freight ran into another. Two men were hurt and a fireman was killed. An engine and 20 cars were destroyed.

The above press dispatch, printed Feb. 21, refers to a road which has been reported to us as employing the absolute block system for freight trains during foggy weather. We have no information as to whether the train dispatcher forgot to notice the fog and to order the blocking rules to be put in effect, or, having put them in effect, he found himself thwarted by unruly engineers; but as impartial historians we deem it our duty to record the impression produced on the reporters of the press by the methods of guarding against collision that were pursued in this case.

In one of the "granger" states, where the Railroad Commissioners are supposed to be authority on all matters relating to railroads, from the most intricate questions of law to the smallest detail of a section laborer's duties, the members of that august body are seriously handicapped in their desire to be thoroughly up with the current literature of railroading. When it became necessary for the auditor of that state to pass upon a subscription bill of from \$3 to \$5 to a railroad publication, for the benefit of the Railroad Commissioners, he informed that body that it was extravagant and that the subscription was a useless expenditure. The records show that the auditor's brother served as deputy state auditor, at a good fat salary, for nearly a year before he was a citizen of the United States.

NEW PUBLICATIONS.

Systematic Mineralogy, Based on a Natural Classification. By Thomas Sterry Hunt, M. A., LL.D. 8vo. pp., XVII., 391; index. New York: The Scientific Publishing Co., 1891. Price, \$5.

Since the publication of this volume its distinguished author has passed away, so that we have here the last results of his life work. As it is the last, so is it the greatest that he has done, in the sense that it is the most complete. It sets forth a new system, a structure solidly erected and only needing to have its details finished off by succeeding workmen.

Breaking away from previous systems of mineralogical classification he has established the close interdependence of chemical and physical characteristics, and made this the basis of the new classification. The doctrine of complex formulas, analogous to those existing among the carbon compounds, is maintained for mineralogical species, and it is shown that in all cases of polymerization and depolymerization the law of volumes holds good, hence the equivalent or molecular weight varies directly as the density. This assumption, which is sustained by a multiplicity of examples, permits of the application of the well known formula for calculating the atomic volume to mineral species, viz., $P + d = v$, where P = equivalent weight, d = specific gravity, and v gives the reciprocal of the coefficient of condensation, whereby the relative condensation of the species may be compared. Since hardness and chemical indifference depend upon this latter characteristic we have here the

one essential for the intelligent study of mineral species which previous investigators declared could probably never be attained.

The various questions which arise in connection with this subject are discussed in chapters under the headings, "Specific Gravity," "The Coefficient of Condensation," "The Theory of Solution," "Relations of Condensation to Hardness and Insolubility," "Crystallization and its Relations" and "The Constitution of Mineral Species." Two chapters are devoted to an explanation of the principles of chemistry, in some respects more complete in details than the author's "New Basis for Chemistry." A monadic notation is here proposed with the object, often attempted, of simplifying mineral formulas, in this case the ordinary chemical symbols being employed, the valencies being indicated by different fonts of type. The symbols also represent numerical values corresponding to 8 parts of oxygen, 16 of sulphur, and 35.5 of chlorine. This notation is used throughout the book, and, while it often shortens, we do not think it simplifies the formulas. Had Dr. Hunt lived he would probably have arrived at a more rational method in conformity with the principles he had so strongly indicated, by giving us the facts of chemical constitution in a mathematical expression of the relations of functions. The monadic notation, however, bears only an accidental relation to the discussion of a natural classification, and to the exhaustive synopsis of native mineral species, which latter occupies 168 pages of the work. The mineral kingdom is divided into four great classes: I. Metallacæ, including non-oxidized metalline minerals—metals, alloys and their compounds, with sulphur, selenium, tellurium, phosphorus, arsenic, antimony and bismuth. II. Halidacæ, comprising fluorides, chlorides, bromides and iodides. III. Oxydacæ, including oxides, borates, carbonates, aluminates, silicates, phosphates, etc.; and IV. Pyricacæ, in which belongs all carbonaceous combustible species. These are subdivided into sub-classes, orders, genera and species. The nomenclature is Latin throughout and expresses salient characteristics, thus doing away with the barbarisms which now afflict mineralogy, and the system is the perfection of simplicity and logical arrangement.

There is a general index and an index to common mineral names, which in the text always accompany the names under the new system.

Bridge Details.

(Continued from page 157.)

MR. BECKER: That would be the last thing to think of putting in the plate hanger in the middle of the pin. The pin is probably a little light, and when you have the shearing reduced to a minimum by bringing the two hangers close to the post footings, taking them away and substituting a single plate hanger in the middle, you naturally increase the bending moment very largely. You will have to drive your pin out and get your new one in, and carry your bridge with false work until it is all done. Rather than go to all that trouble I would build a new bridge. In one case we have used a little equalizer plate, slightly rounded, holding it by these two straps. We rest our floor-beam on the point midway between the two hangers. That is better than building a new bridge. It cost us about \$100, and a new bridge would have cost \$8,000.

MR. SWENSSON: That is just the point; the pin is probably a little light, and so is most everything else in an old bridge. The moral is, therefore: Build a new bridge, and do not tinker with the old.

COMMENTS BY MR. H. B. SEAMAN.

I have been very much interested in the paper on "Bridge Details," and particularly so in Mr. Becker's remarks on the failure of the steel pin. To his inquiry as to the cause of fracture I should say it was because the pin was of steel, and that such a fracture would not have occurred in a good quality of wrought iron, subjected to the same care in manufacture and inspection, and to the same subsequent treatment. It was not due to a flaw in the material, as Mr. Becker expressly states that the fracture was "a clean break," but rather it was due to that characteristic of both steel and cast iron, by which a fracture may be produced from the most incipient scratch. In this instance it required merely a square shoulder to start it.

Wrought iron costs more, but if engineers wish to insure against failures of this kind it will be necessary to abandon the use of steel, as they have already abandoned the use of cast iron. Steel, if used at all in bridge work, must be a perfect product free from all flaws, scratches, or unfilled corners, and inspectors cannot be too careful of the surface defects. Yet we hear of instances in which they have been impressed by the manufacturer with the over refinement of their rejections, that what they have condemned as flaws, only appear to be such, and as a demonstration, the piece is tested under constant strains, and shows no injury, while if it had been subjected to vibration, particularly in extreme cold, very different results would have been obtained.

Steel is a cheaper product than wrought iron, for the same reason that cast iron is cheaper, it requires no puddling, and therefore requires less manual labor in its production. Manufacturers will make steel eyebars, in preference to iron bars of the same section, as being

cheaper, in spite of the fact that steel bars require annealing.

The suggestion in the paper, that riveted connections be so designed that the least section possible be cut, is thoroughly sound from a manufacturers stand point, but is not desirable for maintenance. Iron is an elastic material, and a strain in a member is most severe on the first member and therefore the single rivet would very quickly work loose. This is found to be the case in practice; the loose rivets, of a riveted bridge, may invariably be found among those which receive the first strain.

Strength of Brick Beams in Lime Mortar.

The following results of tests of the strength of brick beams with lime mortar joints, have been abstracted from *Indian Engineering* of Jan. 9, 1892. Thirty beams were made and tested, all about 30 in. square, and broken on a clear span of 10 ft. They were made up in December, 1888, and one-half of them tested in February and the remainder in September, 1889. The mortar joints were $\frac{1}{4}$ in. thick, but neither the character of the lime and sand, nor the proportions used, are given. Three kinds of brick were used.

Class A was composed almost wholly of bats or new half bricks, with three whole bricks in the header course, every 30 in., to insure a slight bonding together.

Class B was composed of whole bricks which had been once used, called demolition brick.

Class C was built of new whole bricks.

The beams were broken by loading them with steel rails, laid on two sleepers, 8 in. x 4 in. and 16 ft. long placed across the beam near its centre. In computing the modulus of rupture, an equivalent load was computed which would give the same bending moment when placed at the centre of the beam; the dead weight of the beam was also taken into account. The following table gives the resulting values of $f = \frac{3 W l}{2 b h^2}$, the ordinary modulus of rupture for rectangular beams.

TABLE OF STRENGTH OF BRICK BEAMS IN POUNDS PER SQUARE INCH.

Period of setting.		A. New half bricks.	B. Demolition whole bricks.	C. New whole bricks.
		Nos. 1 to 7 inclusive.	Nos. 1 to 5 inclusive.	Nos. 1 to 5 inclusive.
Maximum	From 70 to 76 days about	87.78	106.86	112.67
Minimum		75.34	98.86	94.00
Average		79.78	102.86	103.34
		Nos. 8 to 10 inclusive.	Nos. 6 to 10 inclusive.	Nos. 6 to 10 inclusive.
Maximum	From 200 to 270 days about.	94.00	145.51	150.90
Minimum		75.45	112.19	109.56
Average		87.78	126.19	133.23

TECHNICAL.

Manufacturing and Business.

The Consolidated Car Heating Co. has purchased a tract of land at the north side of the city of Albany and has let contracts for the erection of a new factory and warehouse. The first floor of the new building will be used for a shipping room and wareroom for all finished material. A portion of the second floor will be used for offices and the remainder for lathes. The third floor will be used for drills, brass lathes and hand work. The fourth floor will be used for tests and experimental work and will be equipped for testing all apparatus before leaving the factory. The new buildings are expected to be ready on or about June 1.

The Vaulchain wrought iron car wheels will be made by the Standard Steel Works, of Philadelphia, and orders will be taken for the wheels of any size and in any quantity. The details of the process of manufacture of these wheels were given in the *Railroad Gazette* of July 10, 1891. This wheel has recently been adopted for the elevated roads of Chicago, and is being generally used on locomotive trucks built by the Baldwin Locomotive Works.

The Chicago, Burlington & Quincy proposes to put in machinery at Colchester, Ia., for making burnt clay ballast.

Charles L. Sullivan, formerly Superintendent of the Boyden Brake Co., has resigned that position to take the position of Superintendent of the Northwestern Equipment Co., 632 Rookery Building, Chicago.

The King Iron Bridge & Mfg. Co., of Cleveland, has increased its capital stock from \$225,000 to \$1,000,000, changing its name to the King Bridge Co.

The National Switch & Signal Co., of Easton, has recently been awarded contracts as follows: Paducah Junction, Ill., at the crossing of the Chicago & Alton with the Wabash and the Illinois Central, 36 levers. Also at Princeville, Ill., on the Atchison, Topeka & Santa Fe, where it crosses the Chicago, Rock Island & Pacific, 16 levers.

The De La Vergne Refrigerating Machine Co., of New York, has taken contracts in the last month for over 13 of its refrigerating machines, including three 100-ton machines. It is building several 50 and 30-ton ice machines for companies in the South and Southwest.

The Cushion Car Wheel Co., of Indianapolis, reports an unusual mileage with one of its cushion wheels, which was illustrated in the *Railroad Gazette* of Sept.

4, 1891. It has a rubber cushion between the tire and the wheel centre. Mr. John McKenna, Master Mechanic of the Indianapolis, Decatur & Western Railway, writes that the wheels under coach No. 51 after a service of 88,520 miles are worn only $\frac{1}{8}$ in. Two of the wheels ran 20,000 miles, and then had to be trued up because they were misaligned. After that they ran 63,000 miles with only $\frac{1}{8}$ in. wear. They were run with the common cast iron brake shoe in local passenger service.

The Radford Pipe & Foundry Co., Anniston, Ala., has completed arrangements for putting in three new cranes and otherwise improving the Anniston plant.

Iron and Steel.

The National Malleable Iron Works, at Indianapolis, Ind., has been destroyed by a fire, which caused a loss of \$60,000.

Repairs on the Worcester Steel Works at Worcester, Mass., are being made preparatory to starting up the plant under the new management.

The Findlay Rolling Mill Co., of Findlay, O., has increased its capital stock from \$100,000 to \$150,000.

The Missouri Malleable Iron Co. will occupy its new plant at St. Louis, about April 1.

The Sterling Steel Co. is to enlarge its plant at McKeesport, Pa. The improvements embrace two mills, including a department for the manufacture of steel projectiles.

The United Steel Co., of Pittsburgh, has been granted a charter of incorporation. George B. Motherell, of Allegheny, Pa. is Treasurer of the new concern.

The new furnace of the North Carolina Steel & Iron Co., at Greensboro, N. C., is nearing completion.

Subscriptions to the amount of \$80,000 have been made for the purpose of securing the erection of the Delano Iron & Steel Works, at Tacoma, Wash.

The Peoria Steel & Iron Co., of Peoria, Ill., has been formed for the manufacture of steel and iron by J. B. Greenhut, E. C. Howlett and G. J. Gibson. The capital stock is \$500,000.

New Shops and Stations.

A new erecting shop has just been completed by the Pullman Palace Car Co. for passenger cars, at Pullman, Ill. It is built in line with the other erecting shops, with which it is connected by means of a transfer table. The dimensions are 200 x 400 ft. The erecting shops now have a capacity of 200 stalls.

The True Blue Marble Co., of Rutland, Vt., will replace the mill lately destroyed by fire with an iron building, and have placed the contract with the Berlin Iron Bridge Co., of East Berlin, Conn. The building will be composed entirely of iron and marble and will be 80 ft. in width by 254 ft. in length, the side walls being of iron and marble and the roof of corrugated iron. The framework inside for carrying the gang saws, shafting, etc., will also be of iron, so that there will be no woodwork about the building.

The New York & New England proposes to build a new passenger and train shed in Boston this year, which will cost over \$125,000. The company has outlined a policy of extensive repairs on the shops of the system, refitting and building additions wherever necessary.

The Gould Coupler Co. is building machine shops at its Black Rock works near Buffalo, N. Y., at a cost of about \$15,000, for the manufacture of the Cowell platform.

The machinery for the Frankfort, (Ind.) shops of the Toledo, St. Louis & Kansas City road is being placed in position, and the shops will be in running order in a few weeks. The new shops will be used as the general repair and car building shops of the company, employing 250 to 300 men.

Plans have been prepared for the erection of new shops at North Paterson, N. J., for the New York, Susquehanna & Western Railroad. The cost of the new buildings will be nearly \$150,000.

The new Cumberland Valley Railroad shops at Chambersburg, Pa., will be ready for occupancy on April 1.

The Philadelphia & Reading will probably build an extension of 500 ft. to its repair shops in Reading, Pa., giving them a total length of 1,250 ft., and employing 800 to 1,000 men, instead of 400, as now. A paint shop, 190 x 580 ft., in size, has also been staked off.

The Atlantic Coast Line will build a six story office building at Washington, D. C.

Electric Lines Between St. Paul and Minneapolis. A third electric railway between St. Paul and Minneapolis will undoubtedly be built this year. This line will be an extension of the Grand avenue line in St. Paul, will cross the Mississippi River on the Marshall avenue bridge, and will probably connect with the Minneapolis line to Minnehaha Falls. This line will be built if the donors of the bonus for the Selby avenue cable line withdraw their objections to the use of electricity on the extension of that line. This line will be south of the present one, and the other one, noted recently, will be north of it.

Stealing Electricity.

A criminal case has been brought in St. Louis by the Municipal Electric Light & Power Co., whose electricity was alleged to have been stolen by bridging wires before they entered the meter. The point was raised that electricity cannot be stolen, inasmuch as in order to

constitute stealing there must be an asportation, a condition impossible in the case of electricity, which not being in any wise under control, is, therefore, not the goods, property or effects of any one. Judge Claiborne abruptly adjourned the case until he could thoroughly investigate the question.

Aluminum and Organic Acids.

Prof. George Lunge, Ph. D., has settled a very important question concerning the use of aluminum by a series of exhaustive experiments, which he has recently described in the *Engineering and Mining Journal*. Some scientists have lately declared that aluminum will be valueless wherever it comes in contact with organic acids on account of its rapid corrosion, rendering it dangerous as a retainer of potable liquids and for culinary purposes, and uneconomical in engineering works when it would be exposed to possible contact with such acids. Prof. Lunge's experiments disprove these assertions in every particular, which he shows were based upon merely qualitative tests made with aluminum foil. He employed commercial sheet 1 millimetre thick, cut into strips, the edges filed down, each strip thoroughly cleaned first in caustic soda, afterward in sulphuric acid, rinsed and dried. The strips were immersed in solutions of various acids for six days, some of the results of which were, a loss of 1.69 milligrammes from a surface of 100 square centimetres in five per cent. solution of tartaric acid, 4.38 milligrammes in one per cent. solution of acetic acid, 2.15 milligrammes in five per cent. solution of citric acid, 6.2 milligrammes in five per cent. solution of lactic acid, 0.3 milligramme in five per cent. solution of carbolic acid, and 8.3 milligrammes in 0.25 per cent. solution of salicylic acid. Summarizing, he states that the action of coffee, tea and beer is practically zero (0 to 0.5 per cent.), and that of wine, sour milk, fruit juices, etc., too slight to merit consideration. "Taking the worst case found (aside from salicylic acid), namely, that of acetic acid, we find a maximum of attack of less than 5 milligrammes per 100 sq. cm. in six days. Now a canteen holding a litre (nearly a quart) has an inner surface of about 600 sq. cm., and an aluminum weight of about 200 grammes. Such a canteen would lose 5 milligrammes a day, if always full, or 1 gramme in 200 days, and only in 55 years would it be reduced to half its weight." Aluminum compounds exert no effect upon the system except in doses at least 100 times as large as the quantities obtained in the above experiments. The German government has adopted aluminum for the canteens for its soldiers, and its practical non-corrosiveness will extend its use largely in the arts, from which it was becoming tabooed on account of the false impression created by the careless experiments heretofore made.

Big Tools.

The Baldwin Locomotive Works have just put into service their new eight-frame slotter. This is the largest machine used in any locomotive shop in the world, and from actual trial it is found that it will slot eight 4-in. frames piled one on top of the other, with a variation in thickness of about $\frac{1}{1000}$ in. between the top and the bottom frames. They have ordered a 100-ton riveter to be used for the heaviest class of plates. This is in addition to the 75-ton riveter recently put in service.

The Busk Tunnel.

The excavations at the Busk tunnel, on the line of the Colorado Midland, are now progressing at both ends at the rate of 840 ft. a month.

THE SCRAP HEAP.

Notes.

The salaries of the telegraph operators on the Maryland division of the Philadelphia, Wilmington & Baltimore have been increased.

A Denver paper states that the Denver & Rio Grande, after numerous conferences, has increased the pay of its telegraph operators about 5 per cent.

A number of freight brakemen on the Mobile & Birmingham Division of the East Tennessee, Virginia & Georgia have struck for higher wages; but it appears that they are out of a job, their places having been filled by negroes.

The through freight line which operates over the Toledo, Ann Arbor & North Michigan and the Green Bay, Winona & St. Paul, transferring freight across Lake Michigan by steamer, is preparing plans for a transfer boat, like that used by the Michigan Central at Mackinaw, which will carry loaded cars and cut through thick ice.

The Massachusetts Legislature has passed a law which will undoubtedly be approved by the Governor, forbidding its members to accept railroad passes. Their allowance for mileage is increased, so that they can pay fare without loss, though the provision on this point is arbitrary, and members at different distances from the capital will be affected unequally by it.

The San Antonio & Aransas Pass, which has lately engaged a large number of new trainmen on account of the strike, has been been challenged by the old employees, who demanded that 17 new men alleged by them to be incompetent, be examined by a disinterested person. The examination was made by General Superintendent Van Vleck, of the Southern Pacific, who pronounced the men competent, and now everything seems to be serene. Governor Boyd, of Nebraska, has requested the views

of members of the Legislature regarding an extra session for the consideration of a bill to reduce freight rates from 10 to 15 per cent. It is said that the responses encourage the expectation that an extra session will be called.

The Philadelphia & Reading has purchased land in the Moosic Mountains, near Scranton, for a large powder mill for making powder for use in all the collieries now controlled by it.

It is announced that negotiations between the Lake Shore & Michigan Southern road and the World's Fair officials looking toward an independent entrance to the grounds over the Pennsylvania tracks have been abandoned, and that the Lake Shore will enter the southwest corner of the grounds over the tracks of the Baltimore & Ohio.

The General Superintendent of the San Antonio & Aransas Pass, has appointed an inspector with jurisdiction over train, engine, station and maintenance of way departments. His duties are to "impartially criticize existing methods and service." He is authorized to ride upon any train or engine, and to enter upon and inspect any portion of the property of the company.

The United States Supreme Court has sustained the jurisdiction of the Circuit Court for the Northern District of California in the case of the United States against the Southern Pacific Company, the Atlantic & Pacific and the Western Union Telegraph to compel the companies to operate their telegraph lines in accordance with the act of Aug. 7, 1888. The point involved was as to the "inhabitation" of a corporation in certain states.

Spanish American Notes.

The report of Baring Bros. & Co. for 1891 shows a profit of £106,581 over all expenses, out of which the directors propose to declare a dividend of £50,000.

A convention will soon be held in San Salvador for the purpose of arranging anew for a Central American Union, and delegates are now arriving in that city.

The use of gas for illuminating palace cars is becoming popular in Argentina. The Central Railroad has just received permission to put a system of gas lighting into their cars.

The salt works in the Colorado Lagoon, Argentina, belonging to Señor Juan Penco, are producing a very superior grade of salt. A narrow gauge railroad is to be built from Jacinto Arauz to the works, a distance of 22 miles.

Agustin Fraimons, C. E., has closed a contract for the construction of a railroad from San Pablo, on the National Central Northern Railway, in Argentina, across the province of Santiago del Estero, connecting with lines in Santa Fe.

The contracts which had been made with the Brazilian government for the establishment of two large colonies in the middle Amazon have lapsed. New contracts will probably be signed to carry out the project. The middle Amazon, or Solimoes, is the region of largest rubber production and is also excellently adapted to the cultivation of cacao.

The great *saladeros*, or meat packing establishments at Paysandú, and other towns on the Uruguayan side of the Rio Uruguay, are almost idle owing to the excessive export duties of the Uruguayan government. They are further injured by the high import duties of Brazil which, on the other hand, are stimulating this industry in the Brazilian state of Rio Grande do Sul.

An Office Building for the New York Central.

Bradford L. Gilbert, of 50 Broadway, New York, has designed for the New York Central & Hudson River road a ten story office building to cost about \$175,000 and to be built on the south side of Forty-second street between Madison and Park avenues in New York City. The building will be built with a frontage of 63 ft. and will be 126 ft. high and 85 ft. deep. The architect has designed a building with a front of 150 ft. on Forty-second street, but the company proposes to build only part of the structure at present. The building is to provide offices for clerks, the executive officers remaining in the Grand Central station.

The New York & Brooklyn Tunnel Co.

A bill has been introduced in the New York legislature incorporating the New York & Brooklyn Tunnel Co., with a capital of \$15,000,000, for the construction of a tunnel from the intersection of Greenwich, Church and Morris Streets in New York City, under the East River, to the intersection of Smith street and Atlantic avenue in Brooklyn. The incorporators as given in the bill are John N. Drake, W. H. Duckworth, William H. Simonson, Henry Alger, Edward Hall, Walter Field, John P. Fitzgerald, David Hunt, Charles P. Dunwell, Adam Moran, Cornelius Cronan, Joseph E. Wood, Peter Mitchell, A. A. Hill.

Powers of the Interstate Commerce Commission.

The Act to Regulate Commerce expressly requires that transportation charges shall be reasonable, and empowers the Commission to enforce its provisions. Wherever the power of enforcing reasonable rates exists there must also exist the power to ascertain what is reasonable. The Commission is not restricted to finding that an existing rate is unreasonable and forbidding its continuance, but has the further authority to ascertain, order and enforce a rate that is reasonable. The power to determine and declare what is a maximum reasonable rate also results from those provisions of the Act which require the Commission to determine what reparation, if any, should be made by carriers to parties injured by their violations of law, and in cases of unreasonable rates the measure of reparation due to such a party is the difference between the rate actually charged and the reasonable rate which should have been charged. Summary of decision in Florida Strawberry case, paragraph 1, by Commissioner Veasey.

The Champion Train Robber.

A train robber, who tried to rifle a car of the American Express Co. on the New York Central, between Syracuse and Lyons, on the morning of Feb. 21, succeeded in making a sensation equal to any ever invented by a novelist. The man, Oliver C. Perry, who is the same one that robbed a car near Utica on Sept. 30 last, let himself down from the roof of the car while the train was running rapidly and disabled the mes-

senger by shooting him twice, though not until after the latter had succeeded in pulling the signal to stop the train. When the train stopped Perry eluded the trainmen, but when a further search was made at Lyons station he appeared on the platform among the bystanders, but he "stood off" the crowd with two pistols and seized a freight engine, with which he ran several miles westward on the freight track alone. The express engine was at once started in pursuit on the passenger track, but when it came alongside of the robber he opened fire on the men in charge. After considerable excitement he finally got ahead far enough to leave his engine and flee into the woods on horseback. He was finally captured in a swamp, after having threatened the lives of farmers to get horses from them, etc. He had secured no booty. He is an experienced criminal, but is genteel, even effeminate, in appearance and behavior.

LOCOMOTIVE BUILDING.

The West Virginia Central Railroad last Friday received two heavy freight locomotives from the Baldwin Locomotive Works at Philadelphia, and have several others under way at that shop.

The Chicago, Milwaukee & St. Paul is soon to receive a Baldwin compound locomotive. It is to be tested for one month with a dynamometer car, after which a new Baldwin simple engine will be tested in the same way, to get comparative results.

The Richmond Locomotive & Machine Works has an order from the Chesapeake & Ohio for ten 19 x 24-in. 10-wheel locomotives, and for fifteen 30 x 24 consolidation engines, in addition to the order for 11 ten-wheelers from the same road, placed some time ago.

Five new freight engines for the Rio Grande Western have been received at the Burnham shops in Denver from the Baldwin Locomotive Works. The new passenger engines are not yet out of the New York Locomotive Works shops at Rome, N. Y.

CAR BUILDING.

The Long Island road has let contracts for 250 coal cars to the Middletown Car Works, and for 150 box cars to the Lebanon Manufacturing Co.

The order of the New York Central & Hudson River road for freight cars, noted last week, was for 3,000 cars, and contracts were awarded as follows: 1,000 coal cars, to Murray, Douglass & Co., deliveries to commence in April; 1,000 box cars to the Buffalo Car Co., deliveries to be as follows: 500 by May 15, and 500 by June 15; and 1,000 box cars to the Michigan Car Co., 500 to be delivered in April, and 500 in May.

The Terre Haute Car & Manufacturing Co. has delivered 300 of the Hicks patent live stock cars on its contract with the Cleveland, Cincinnati, Chicago & St. Louis, to build 600; the other 300 are to be delivered at the rate of 100 a month.

BRIDGE BUILDING.

Annapolis, Md.—The Governor of Maryland has approved bills authorizing the construction of a bridge over Weems Creek in Anne Arundel County.

Bethlehem, Pa.—The Allentown rolling mills, of Allentown, Pa., have been awarded the contract to strengthen the eight spans of the New street bridge at Bethlehem, Pa., from the canal bank to the southern entrance. The plan adopted consists of a series of iron trusses supporting each span, excepting the two spans over the Lehigh Valley Railroad; on these two last spans steel floor beams will be placed instead, in order not to interfere with trains.

Camden, N. J.—The Senate of New Jersey has passed the bill giving the consent of New Jersey to build a bridge over the Delaware River between Camden and Pennsylvania.

Chamberlain, S. Dak.—Arrangements have been completed between the Chamberlain Pontoon Bridge Co. and the City Council for building a pontoon bridge across the Missouri River at a location not yet decided upon.

Cumberland, Md.—The West Virginia Central & Pittsburgh Railroad will build a steel viaduct to take the place of the wooden trestle work now connecting the Central Station, at Cumberland, Md., with the iron bridge over the Potomac River. The spans will be each 25 ft. in length, and will be supported by substantial iron columns resting on stone foundations. Work will be commenced this spring, the plans having been prepared.

East Vincent, Pa.—A new bridge over Stony Run, in East Vincent township, Chester County, was formally accepted by the township officials last week.

Fairmount, W. Va.—The Wrought Iron Bridge Co., of Canton, O., will begin the construction of the iron bridge across Coal run for the Development Co. at once.

Hamilton, O.—A bill has been introduced in the Ohio Senate to authorize the Commissioners of Butler County to issue \$25,000 in bonds to build a bridge over the Big Miami River at Black street in the city of Hamilton.

Hampton, Va.—The East Hampton Development Co. has obtained authority from the legislature to construct a bridge across the Hampton River in Elizabeth City County.

Hawkinsville, Ga.—The Commissioners of Pulaski county will receive sealed proposals until March 22 for removing the fixed iron highway bridge across the Ocmulgee River and constructing in its place an iron or steel drawbridge.

Matagorda County, Tex.—The county commissioners will receive bids during the May term for the construction of six iron or wooden bridges to be built in this county.

Memphis, Tenn.—The City Engineer has been authorized to ask for bids for building a pile bridge to cost about \$2,500 and to be built over Bayou Gayoso, at Main street.

Philadelphia.—An ordinance has passed the City Council authorizing the construction of bridges at Shur's Lane, Manayunk; Morris street over the Chestnut Hill branch of the Pennsylvania Railroad; and the reconstruction of bridges at Front street over the Richmond branch of the Reading Railroad; and at Girard avenue over the Reading Railroad in the Twenty-ninth Ward. The cost to the city shall not exceed \$23,500 for the Shur's Lane bridge, \$1,500 for Morris street, \$15,000 for Front street and \$30,000 for the Girard avenue bridge.

Poland, N. Y.—The Adirondack & St. Lawrence is erecting across the Kuyahora River, below Poland, a deck girder bridge with buckle plate floor. The bridge will contain three spans, each 73 ft. 10 in., and one span 68 ft. 10 in. in length.

Sedalia, Mo.—The Missouri Pacific has commenced work strengthening and rebuilding all the bridges and culverts along the narrow gauge railroad between Sedalia and Warsaw.

Washington, D. C.—Senator Gibson of Maryland has introduced a joint resolution providing for a survey for a new bridge across the eastern branch of the Potomac River, at the foot of South Capitol street, and authorizing the expenditure of \$5,000 in making the survey.

West Superior, Wis.—City Engineer Banks has completed his estimate of the proposed bridge between this city and West Duluth, Minn. The total cost of the structure will be \$110,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Connecticut the Court of Appeals decides that the statute of 1875 as amended in 1878 which provides that when only part of a railroad lies in the state it shall pay taxes on such proportion of the valuation of its capital stock, funded and floating debt, and bonds as the length of its road lying in the state bears to the entire length of the road, is not unconstitutional as laying a tax on interstate commerce.¹

The Supreme Court of Mississippi decides that tolls received by one railroad company from another for the joint use of the track of the former, computed not upon the amount of the gross receipts, but at a certain specified sum per ton or per passenger, are not within Act Pa. June 1, 1889, which provides that a railroad company owning, operating, or leasing any railroad shall pay a tax upon the gross receipts "received from passengers and freight."²

In Nebraska the Supreme Court holds that the statute of 1881, which requires corporations to record their articles with the county clerk of the county in which their business is to be transacted, does not apply to articles of consolidation of railroad corporations, but a duplicate of the agreement must be filed with the Secretary of State, as required by another statute.³

In Illinois the Supreme Court rules that a city cannot extend a street over a railroad company's tracks and right of way by condemnation of the land, and acquire the exclusive right to the land, as in extending it over all other property under the general power, but its right is measured by the clause under which it can acquire the right only to use such part of the railroad company's property jointly with the company.⁴

In Nebraska the Supreme Court holds that where a railroad company, organized under the laws of Nebraska, consolidates its stock and franchises with those of a foreign corporation, pursuant to the laws of Nebraska, the consolidated company is also a Nebraska corporation, and as such entitled to acquire property by the exercise of the power of eminent domain.⁵

In Connecticut it is held by the Supreme Court that in the absence of any statutory provision for compelling railroad companies to pay their state taxes, such taxes may be collected by an action brought by the state.⁶

Injuries to Passengers, Employees and Strangers.

In Texas in an action by a passenger for injuries caused by a car being thrown from the track by reason of the breaking of a wheel, it appeared that the train was running at the rate of 16 or 20 miles per hour, where the schedule rate was 4 miles; that the air brakes were defective, but for which the engineer might have stopped the train; that the rails were old and battered, the ties rotten, and the road-bed rough and uneven. The Supreme Court holds the railroad liable.⁷

In New York the plaintiff was in charge of a car load of horses. Before arriving at B. the conductor told plaintiff that the caboose would go no further than B., and that plaintiff would thereafter have to ride in the car with his horses; that at B. the train would stand for 45 minutes where left, and that plaintiff could get supper and then take the train. At B. plaintiff left the train for supper, and returned in about 30 minutes, when the train had been shifted two tracks further off, and a locomotive attached to its rear. To get on the train, plaintiff had to walk around such engine by a passage used by defendant only in connection with its cattle yards. He passed close to the engineer, who was looking in the direction plaintiff was going. While entering the car by the side door the train started, injuring plaintiff. The Supreme Court holds the railroad liable.⁸

The Supreme Court of Nebraska holds that a passenger is entitled to a reasonable time to leave or alight from the car in which he is riding when a train is stopped for that purpose; and when reasonable time is not in fact given in which to alight in safety, and injuries result to him in attempting to do so, the passenger is entitled to recover from the railroad company, unless in making the attempt he is guilty of criminal negligence, or is violating some express rule or regulation of the company, actually brought to his notice, as provided by statute.⁹

In Iowa a gang of laborers were removing a timber from a railroad bridge by means of a pile-driver. While suspended from the pile-driver the lower end of the timber rested on a car, while the upper became caught in the driver frame. Plaintiff was trying to push the foot of the timber from the car, when, by direction of the foreman, other laborers loosened it from the driver, causing it to slip and strike plaintiff. The question being whether he was so engaged by the foreman's orders, plaintiff testified that on account of the noise the foreman's orders could not be heard, and that he was directing the men by motions; that plaintiff was standing out of the way of the timber when the foreman "motioned at him, and shook his head;" "that he could not say what he said," and did not know what he motioned for, but went ahead because the motion gave him orders to shove it off. The Supreme Court holds this insufficient to warrant a finding that the foreman ordered plaintiff to move the timber, or saw that he was attempting to do so.¹⁰

In Texas the plaintiff sued to recover for the death of his son, who was killed while working on a gravel train in a collision between that train and a regular freight train. The evidence was that the train dispatcher wired the conductor of the gravel train to work until 11:30, regardless of the freight; that at and after 11:30 it was his duty to have his train on a siding, or protected by a flag; that the collision occurred on the main line at 11:47 to 11:50, and that the gravel train was not protected at the time by any flag. The Supreme Court rules that the injury resulted, not from the negligence of the train dispatcher, but from that of the conductor, who was a

fellow-servant, and the defendant therefore was not liable.¹¹

In Pennsylvania in an action against a news company for the death of a boy, it appeared that the defendant company employed the boy to sell newspapers and other articles on railroad trains, at a certain town; that he was expressly instructed to sell only while the train was standing at the station; that he was to board the cars as soon as they stopped, pass through with his basket, and leave the train before it started; and that, if the train did start, he was to go to the next stopping place. Instead of obeying his instructions, however, he attempted to get off after the train was in motion, and had gone some distance. Whether he fell off or jumped off was not known. The Supreme Court rules that there was no negligence shown on the part of the company, and that it was not liable, even though the boy was employed without the knowledge of his parents.¹²

In Minnesota a hand car used by section hands in defendant's employ was stopped 300 ft. distant from a locomotive standing on defendant's track, and the men were set to work on the track. Soon after, the locomotive was discovered slowly backing down toward the hand car, being 200 ft. distant therefrom when first seen by the men. The foreman immediately ordered the removal of the car by the men, and one of them was injured in a collision between it and the locomotive while obeying such order. The Supreme Court holds the railroad liable.¹³

In North Carolina an experienced laborer who knew that the road was rough and crooked, was riding on a material train running very rapidly. He was in a closed car, having a large opening in one of its sides, and moved from the rear of the car, where he was protected, toward the stove, located in the center; and as he passed by the opening the train made a swift curve, which threw him out of the car. The Supreme Court rules that plaintiff was guilty of contributory negligence in passing by the opening without supporting himself, when he might have reached the place he intended to occupy by passing along the side of the car opposite to the opening.¹⁴

In Massachusetts the plaintiff was uncoupling cars and stepped between them, when his foot was caught between a tie and a switch rod, which was 5½ in. above the ground. The switch rod had been in that condition a week or more, but after the accident the space was partly filled up. The railroad is held liable.¹⁵

In Iowa the Supreme Court holds that a brakeman employed on a railroad for three years is presumed to know the distance of wing fences from the rails, and when acting without orders, is guilty of negligence, in standing on the side ladder of a moving car and leaning out, although he is trying to see if there is anything wrong under the train.¹⁶

In the Federal Court it is held that one who accepts employment from a railroad company as a switchman in its yard assumes the risk of injuries resulting to him from a visible defect in the locomotive on which he was to work, consisting of a draw head so short as to leave too small a space between the locomotive and any car to be coupled to it for the switchman to work in with safety.¹⁷

In Virginia the Supreme Court rules that a brakeman who enters into the employ of a railroad company owning cars, the couplings of which are mismatched, and who continues to use such couplings for over a year without any promise by the company to change them, assumes the extra hazard incident to the use of the mismatched couplings, and no recovery can be had from the company for his death resulting from their use.¹⁸

And in the same case it is decided that a brakeman who, in coupling cars, with knowledge that the couplings are mismatched, places the pin in the moving car, and remains between the two cars to shake the pin into position, when he might have safely made the coupling by placing the pin in the standing car and permitting it to be shaken into position by the concussion of the two cars, is guilty of negligence, and no recovery can be had for his death resulting from being crushed between the two cars.¹⁹

- ¹ State v. New York, N. H. & H. R. Co., 22 Atl. Rep., 765.
- ² Commonwealth v. N. Y., L. E. & W. R. Co., 22 Atl. Rep., 806.
- ³ Trester v. Mo. Pac. R. Co., 49 N. W. Rep., 1,110.
- ⁴ Illinois Cent. R. Co. v. City of Chicago, 28 N. E. Rep., 740.
- ⁵ Trester v. Missouri Pac. R. Co., 49 N. W. Rep., 1,110.
- ⁶ State v. New York, N. H. & H. R. Co., 22 Atl. Rep., 765.
- ⁷ T. & P. R. Co. v. Hamilton, 17 S. W. Rep., 406.
- ⁸ Pitcher v. L. S. & M. S. R. Co., 16 N. Y. Supp., 63.
- ⁹ Omaha & H. V. R. Co. v. Chollette, Neb., 49 N. W. Rep., 1,114.
- ¹⁰ McCarthy v. Chicago, R. I. & P. Ry. Co., 50 N. W. Rep., 31.
- ¹¹ Corona v. Galy, H. & S. A. Ry. Co., 17 S. W. Rep., 384.
- ¹² McMellen v. Union News Co., 22 Atl. Rep., 768.
- ¹³ Britton v. N. P. R. Co., 50 N. W. Rep., 231.
- ¹⁴ Taylor v. Richmond & D. R. Co., 13 S. E. Rep., 733.
- ¹⁵ Hannah v. C. R. R. Co., 28 N. E. Rep., 682.
- ¹⁶ McKee v. C. R. I. & P. Ry. Co. (Ia.), 50 N. W. Rep., 296.
- ¹⁷ Brooks v. Northern Pac. R. Co., 47 F. 667.
- ¹⁸ N. & W. R. Co. v. McDonald's Adm'r, 13 S. E. Rep., 706.
- ¹⁹ N. & W. R. Co. v. McDonald's Adm'r, 13 S. E. Rep., 706.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Columbus & Xenia, quarterly, 2½ per cent. on the common stock, payable March 10.
- Northern Pacific, quarterly, 1 per cent. on the preferred stock, payable April 15.
- Philadelphia & Erie, \$1 a share, payable March 15, the first dividend ever declared on the common stock.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Atlanta & Charlotte, air line, general, New York City, N. Y., March 9.
- Bedford & Bloomfield, annual, Indianapolis, Ind., March 9.
- Chicago Junction Railways & Union Stock Yards Co., special, New York, N. Y., March 1.
- Fort Worth & Denver City, annual, Fort Worth, Tex., March 1.
- Grand Rapids & Indiana, annual, Grand Rapids, Mich., March 2.
- Herkimer, Newport & Poland, annual, New York City, March 1.
- Louisville, New Albany & Chicago, annual, Indianapolis, Ind., March 9.
- Malone & St. Lawrence, annual, New York City, March 1.
- Missouri Pacific, annual, St. Louis, Mo., March 8.
- Mohawk & Adirondack, annual, New York City, March 1.
- New York & New England, annual, Boston, Mass., March 8.
- New York & Northern, special, New York City, N. Y., March 3.

- Norfolk & Southern, annual, Norfolk, Va., March 3.
- Oregon Short Line & Utah Northern, annual, Salt Lake City, Utah, March 16.
- Orleans, West Baden & French Lick Springs, annual, Indianapolis, Ind., March 9.
- Pennsylvania, annual, Philadelphia, Pa., March 8.
- St. Lawrence & Adirondack, annual, New York City, March 1.
- St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 8.
- Wichita Valley, annual, Wichita Falls, Tex., March 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Railway Freight Claim Association of the Eastern, Western and Southern States will hold its regular semi-annual meeting at the Grand Pacific Hotel, Chicago, Ill., March 3.

The New England Railroad Club holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The New York Railroad Club holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The Southern Railway Club holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The Central Railway Club meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The Northwest Railroad Club meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The Engineers' Club of St. Louis holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The Engineers' Club of Philadelphia holds regular meetings at the House of the Club, 112 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The Civil Engineers' Club of Cleveland holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the South holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers and Architects holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The Engineers' Club of Minneapolis meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The Canadian Society of Civil Engineers holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The Association of Civil Engineers of Dallas meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The Technical Society of the Pacific Coast holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The Tacoma Society of Civil Engineers and Architects holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

Engineers' Club of St. Louis.

A regular meeting was held Feb. 17, 1892, at Washington University, President Johnson in the chair, and 50 members and 8 visitors present.

The secretary read a communication from the Committee of Engineering Societies of the Columbian Exposition in regard to the proposed engineering congress and the division of the different branches of engineering.

Mr. Robert Moore then spoke on the subject of "The Merchants' Elevated Terminal Railway." Mr. Moore exhibited a large number of views showing the work as it progressed from the foundations to the completion of the structure. A number of interesting tests in regard to fastening the anchor bolts for the columns were described, and it was shown that when the bolts were placed in rock, Portland cement was the most satisfac-

tory. The illustrations showed in detail the manner of erecting the spans.

CHICAGO & ST. LOUIS ELECTRIC RAILWAY.

Prof. J. B. Johnson then described "A Straight Line Railway Survey Between St. Louis and Chicago." The survey now being made between St. Louis and Chicago for the Chicago & St. Louis Electrical Railway Co. is proceeding in a direct straight line from a chosen point in East St. Louis to a chosen point in Chicago. A casual inspection of the region to be traversed indicated that a straight line road would probably fit the ground as well as any other, and would not pass through any town or village of importance, which for a high speed road is very desirable. The question of grade also is unimportant in this case, since grades as high as five or six per cent. can readily be overcome by a single or double car electric service. Since the proposed speed is 100 miles per hour, it is a real advantage to avoid curves. If a straight line can as well be secured, therefore, as any other, it was thought best to do so. The direction of this line has been computed from the known latitude and longitude of the two terminal points, and the line is being run by a transit, the forward points being set by double reversals of the instrument, and bisecting the space between the two positions. The azimuth of the line will be checked every 10 miles by observations on Polaris, made at any convenient hour, using a table especially computed for such work.

Engineers' Society of Western Pennsylvania.

At the annual meeting the following officers were elected: President, Alfred E. Hunt; Vice-Presidents—one year, Phineas Barnes; two years, Chas. Davis; Directors, Robt. Munroe, G. W. G. Ferris; Secretary, R. N. Clark; Treasurer, A. E. Frost.

At the meeting of Feb. 16 a paper was read by Mr. William Metcalf on "Smoke." Extracts from this paper are printed on another page.

The Civil Engineers' Club of Cleveland.

A regular meeting was held at the club rooms on Tuesday evening, Feb. 9, with President Gobeille in the chair and 27 members and three visitors present. Circular No. 2 of the Executive Committee of Engineering Societies, Columbian Exposition, was read, and after some discussion the action of the committee as outlined in this circular was approved. The committee appointed to nominate candidates for officers for the ensuing year reported a list of two candidates for each office. A committee of seven members was appointed with power to select the date and arrange for the annual banquet.

Mr. John L. Culley read the paper of the evening, entitled: "Mining Engineering." He gave an interesting account of the work to be done in making surveys of mines, from the time the engineer arrives on the ground till the last course is finished and the manner in which this work should be done. The difficulties encountered, and the methods of overcoming them, were fully described, also the checks that are used in proving the correctness of the survey, and the methods of locating the required lines on the surface.

The paper was discussed by a number of members and several ingenious methods were described for overcoming many of the difficulties encountered during the execution of the kind of work.

PERSONAL.

—Major A. M. Sevier, formerly Railroad Commissioner of Missouri, died at Neosho, Mo., this week, aged 63 years. He was Commissioner from 1879 to 1885.

—Mr. T. A. Bissell, Manager of the Wagner Palace Car Works at East Buffalo, will go to Bermuda for a month, leaving Buffalo on March 8. His health has been poor for some time.

—General Manager George F. Evans, of the Louisville, Evansville & St. Louis Air Line, resigned this week to become Superintendent of the Southern Division of the Boston & Maine road at Boston.

—J. Otto Heppner, Assistant Comptroller of the Southern Pacific Company, died at San Francisco last week. Mr. Heppner has been Assistant Comptroller since the Southern Pacific consolidation.

—Mr. Charles Brent is to be the new Assistant General Freight Agent of the Louisville & Nashville. Mr. Brent has been Contracting Freight Agent of the Louisville & Nashville at Cincinnati for about 15 years.

—Mr. M. L. Hinman, who has been Vice-President and Treasurer of the Brooks Locomotive Works for a number of years, has been chosen President and Mr. R. J. Gross, General Agent, has been chosen Vice-President.

—Mr. John Fulton, General Manager of Cambria Iron Co., has resigned, and Mr. Charles S. Price has been appointed General Manager. Mr. Fulton has been reappointed to his former position of General Mining Engineer.

—Mr. W. C. Rinearson, late General Passenger Agent of the New York, Lake Erie & Western, has been offered the position of Southern Passenger Agent of the Chicago, St. Paul & Kansas City, but has not yet decided to accept the office.

—Mr. Charles J. Carney has been appointed Superintendent of Machinery of the Brooks Locomotive Works, at Dunkirk, N. Y. Mr. H. C. Crowell, of Westfield, will take the position formerly held by Mr. Carney, of Mechanical Engineer and Superintendent of the Dunkirk Engineering Works.

—Mr. Edgar Van Etten, Manager of the Western New York Car Service Association, has resigned and Mr. William W. Halsey, General Car Agent of the Western New York & Pennsylvania has been chosen as his successor. Mr. Van Etten's resignation is due to the fact that he has been appointed Superintendent of the Western division of the Lehigh Valley with headquarters in Buffalo, the appointment taking effect March 1. He was formerly Superintendent of the Buffalo Division of the New York, Lake Erie & Western. Mr. Halsey has been with the Western New York & Pennsylvania nearly 20 years, and has long experience, as well as natural adaptation to that branch of the service.

—Mr. D. W. Sanborn has been appointed General Superintendent of the Boston & Maine. Superintendents of divisions, the superintendent of motive power, the master car builder and the superintendent of car service will report directly to him. In 1884 he was a conductor on the road, running first between Portland and Portsmouth, and later between Portland and Boston. After 15 years of service in that branch of railroading he was made Master of Transportation, which position he filled until 1884. Then occurred the consolidation of the Eastern road with the Boston & Maine, and Mr. Sanborn

was made Superintendent of the Eastern Division. He was transferred to the Southern Division on July 1, 1890.

—Mr. Lucius Tuttle, General Manager of the New York, New Haven & Hartford, has been elected Vice-President, to fill the vacancy caused by the death of Mr. Edward M. Reed. He has been General Manager of the company since March, 1890, and was Assistant Trunk Line Commissioner for the Passenger Department for the year previous. Mr. Tuttle was born at Hartford, Conn., in 1846, and has been in the passenger department of various New England railroads for the last 22 years. He was a General Ticket Agent at Hartford for about 12 years and then Assistant Passenger Agent of the New York & New England. He was appointed General Passenger Agent of the Eastern Railroad in 1879, General Passenger Agent of the Boston & Lowell in 1885, and Passenger Traffic Manager of the Canadian Pacific in 1887.

ELECTIONS AND APPOINTMENTS.

Akron & Eastern.—The incorporators are: W. A. Lynch, of Canton, O.; J. W. Holloway, D. E. Hill, K. B. Conger, Lewis Miller, C. W. Risley and J. H. Sample, all of Akron, O.

Arkansas, Oklahoma & Texas.—The first board of directors of this company is as follows: A. A. Newman, H. P. Farrar, F. M. Strong, C. R. Sipes, J. Mack Love and T. W. Eckert, all of Arkansas City, Kan.; and J. V. Admire, Kingsfisher, O. T.; C. L. Severy, El Reno, O. T., and Robert E. Huff, Wichita Falls, Tex.

Bellingham Bay & Eastern.—The officers of this company are: President, Edward Eldridge, New Whatcom, Wash.; Vice-President, S. T. Hauser, Helena, Mont.; and Secretary and Chief Engineer, J. J. Donovan, Fairhaven, Wash.

Boston & Maine.—Daniel W. Sanborn has been appointed General Superintendent with headquarters at Boston. All superintendents of divisions, the superintendent of motive power, the master car builder, and the superintendent of car service report directly to him.

Central of Georgia.—The jurisdiction of C. A. Darlton, Superintendent of Telegraph of the Richmond & Danville, has been extended over this road, and all leased and operated lines of the Richmond & Danville.

Central of New Jersey.—Samuel Sloan, President of the Delaware, Lackawanna & Western, was elected a director of this company at a special meeting of the Board, Feb. 23.

Chicago, Lake Geneva & Northwestern.—The incorporators and first Board of Directors are: De Clement Dunlap, Rockford, Ill.; Fremont Hill, Horace C. Alexander, John S. Mink and Frank C. Elliott, Chicago.

Chihuahua Eastern.—The incorporators are H. L. Warren, Lerion Miller, Thomas F. Hunt, of Albuquerque, N. Mex., and Thomas McManus, of Chihuahua, Mexico.

Cleveland & Canton.—Frederick R. Briggs has been appointed Assistant General Passenger Agent. He has been for about 10 years a passenger conductor.

Delaware, Lackawanna & Western.—The annual meeting of the stockholders in New York, Feb. 23, resulted in the election of the following directors: John I. Blair, George Bliss, Percy R. Pyne, Wilson G. Hunt, W. W. Astor, Edgar S. Auchincloss, William H. Appleton, William Rockefeller, Eugene Higgins, Henry A. C. Taylor, Benjamin G. Clarke, A. H. McClintock, J. Rogers Maxwell and George F. Baker. Mr. Maxwell and Mr. Baker succeed Russell Sage and Sidney Dillon. The directors re-elected Samuel Sloan President, it being his twenty-fifth election. F. F. Chambers was re-elected Secretary and F. H. Gibbons Treasurer.

East Tennessee, Virginia & Georgia.—E. T. Charlton, formerly General Passenger Agent of the Central of Georgia road, has been made joint agent of the Queen & Crescent and East Tennessee, Virginia & Georgia at Chattanooga.

F. B. Boatman has been appointed Master Mechanic of the Louisville Southern Division, with headquarters at Ludlow, Ky.

Elizabethtown, Lexington & Big Sandy.—The New York News & Mississippi Valley Co., on Feb. 16 assigned to the Chesapeake & Ohio the lease under which it was operating this road. L. F. Sullivan has been appointed Auditor, with headquarters at Richmond, Va.; Epes Randolph, Superintendent, with headquarters at Lexington, Ky.; Charles L. Brown, General Freight and Passenger Agent, with headquarters at Lexington, Ky.; also C. S. Welton, Train Master and Chief Train Dispatcher, with headquarters at Ashland, Ky.; W. R. Morris, Master Mechanic, with headquarters at Ashland, Ky.

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Erie Dispatch Line.—H. D. Chamberlin, Acting General Manager of the Erie Dispatch fast freight line, has been made General Manager, the appointment to take effect March 1.

Florence, Cripple Creek & State Line.—The incorporators are: Hon. J. A. McCandless, Thomas Robinson, Isaac Canfield, James Collins, William E. Johnson, George E. Bradbury, H. C. Topping, M. B. Robinson and J. P. McConnell. The officers are: W. E. Johnson, President; Thomas Robinson, Vice-President; Isaac Canfield, Secretary; J. F. Collins, Treasurer; J. A. McCandless, General Manager. The headquarters of the company are at Florence, Col.

Guatemala Central.—D. B. Hodgson, Chief Clerk in the Auditor's Department of the Southern Pacific at New Orleans, has accepted the position of Auditor of this railroad. He has been connected with the Southern Pacific for 15 years.

Illinois Central.—F. T. Hausard, Yardmaster of the Louisville, New Orleans & Texas for six years, has resigned to accept the position of General Yardmaster of this road.

Illinois & Iowa Railway & Terminal Co.—The incorporators and directors are C. C. Coon and Judge E. H. Thayer, of Clinton, Ia.; M. S. Like, of Princeton; C. W. Disney and T. J. Dadds, of LeClaire, and Major M. L. Marks, George T. Baker, George E. Hubbell, M. J. Eagal and E. H. Whitcomb, of Davenport, Ia.; and Morris Rosenfeld, Hon. Chas. H. Deere, H. A. Ainsworth, H. A. Harnard and J. W. Atkinson, of Moline, Ill.

Kansas City & New Orleans.—The officers of the company are W. A. Disborough, President; Hugh Stewart, Chief Engineer; and M. M. Hannah, Secretary. The present headquarters are at 314 Commerce Street, Dallas, which will be changed to Dalby Springs about April 1.

Lehigh Coal and Navigation Co.—The annual meeting of the stockholders of the company was held in Philadelphia, Feb. 23. The following Board of Managers was elected: Joseph S. Harris, President; Edward W. Clark, Francis R. Cope, Charles Parrish, James M. Willcox, Edward Lewis, Samuel Dickson, Edward B. Leisenring, Abram S. Hewitt, Thomas McKean, Charlemagne Tower, Jr., and Edward S. Buckley.

Maryland & Washington.—The incorporators are Wright Rives, Louis D. Wine, John O. Johnson, Charles A. Wells, A. O. Bliss, Van H. Manning, Wallace A. Bartlett, B. D. Stephen, D. M. Nesbit, Pinckney A. Scaggs, Fillmore Bead, Stephen Gambrell, William I. Hill, Charles Stanley, Frank Browning and Charles E. Coffin, of Maryland; and Joseph A. Blundon, Edwin H. Newman and Ellis Spear, of the District of Columbia.

Meriden, Waterbury & Connecticut River.—F. H. Prince, of Boston, has been elected President of the road, and Newman Erb, of New York, Vice-President.

Montgomery Terminal.—The incorporators of the reorganized company are: H. C. Bagley and P. C. Clegg of Americus, Ga., and A. M. Baldwin, J. T. W. Deming, J. J. Halliday, C. H. Roquemore, B. P. Seals, of Montgomery, Ala.

Nampa Railway & Construction Co.—The following directors have been chosen: Hon. M. A. Kurtz, P. C. Jones, K. W. Purdum, J. W. Griffith, John P. Tate, A. Fouch and J. Steinmeier, of Nampa, Idaho. P. C. Jones, of New York, was elected President.

New York, Lackawanna & Western.—Following is the result of the election for Directors of the road: Samuel Sloan, John I. Blair, Percy R. Pyne, George Bliss, Wilson G. Hunt, Henry D. Polhemus, Eugene Higgins, Edgar S. Auchincloss, M. T. Pyne, Frederick H. Gibbons, Samuel Sloan, Jr., William F. Hallstead and William R. Storrs.

Norfolk, Wilmington & Charleston.—The following list of directors and officers was published this week: Ex-Gov. Thomas J. Jarvis, of North Carolina; R. Duncan Harris, of New York; J. C. McNaughton, of Philadelphia; Henry E. Young and Thomas A. Haquemin, of Charleston, S. C.; Thomas Pinckney, of Richmond; A. A. Gaddis, of New Jersey; Chambers H. McKibbin, of Washington, D. C.; and A. C. Haskell, of Columbia, S. C. The officers are: President, John C. McNaughton; Treasurer, R. Duncan Harris; Secretary, Carroll Forster; General Manager, C. H. McKibbin.

Northern Pacific.—J. G. Boyd has been appointed general agent in charge of the freight and passenger business of the Cœur d'Alene district in addition to his duties as assistant superintendent of the Cœur d'Alene Railway & Navigation Co., with headquarters at Wallace, Idaho, vice John Dorsey, promoted to Superintendent of the Yellowstone division.

Ohio & Big Sandy.—M. E. Ingalls, recently elected President of this company, announces the following appointments, effective Feb. 16: L. F. Sullivan, Auditor, with headquarters at Richmond, Va.; Epes Randolph, Superintendent, with headquarters at Lexington, Ky.; Charles L. Brown, General Freight and Passenger Agent, with headquarters at Lexington, Ky.; also C. S. Welton, Train Master and Chief Train Dispatcher, with headquarters at Ashland, Ky.; W. R. Morris, Master Mechanic, with headquarters at Ashland, Ky.

Pennsylvania.—J. B. Hutchinson, Superintendent of the Maryland Division of the Philadelphia, Wilmington & Baltimore road, will soon take the position of Superintendent of the New York Division of the Pennsylvania Railroad. Since Superintendent Joseph Crawford was disabled by an accident a year ago, E. F. Brooks, Engineer of Maintenance of Way, has been the Acting Superintendent of New York Division.

Philadelphia & Reading.—The following appointments have been announced: J. Rogers Maxwell to be First Vice-President, with office in New York; Charles Hartsborne, Second Vice-President, in charge of the finances of the company; Robert H. Sayre, Third Vice-President, in charge of Construction and Maintenance of Way; John Taylor, General Traffic Manager, and Henry S. Drinker, Assistant to President.

Pittsburgh & Castle Shannon.—The annual meeting was held at Pittsburgh, Feb. 16. Walter Chess was chosen President and the following Directors: Jacob Geib, L. S. McKallip, James M. Bailey, W. H. Brunt, P. F. Schuchman, James R. Redman, H. Dana Rolfe, C. Zugsmith, Jr., H. T. Morris and J. M. Conroy.

Portsmouth, Smithfield & Western.—The incorporators are James F. Maupin, W. G. Maupin, Jr., W. H. Stewart, of Portsmouth and Norfolk, Va., and J. O. Magruder, of Albemarle County, Va.

Ravens Springs & North Arkansas.—The officers of the company are: John B. Jones, Little Rock, Ark., President; J. B. Duvall, Ravens Springs, Ark., Secretary, and P. L. Daugherty, Springfield, Mo., Engineer.

Rome, Watertown & Ogdensburg.—Henry Whiton, who has been the Boston freight agent of the line, has been promoted to the New England agency of the same system.

St. Louis, Keokuk & Northwestern.—The following changes have been announced to take effect March 1: N. J. Paradise, Master Mechanic of east division Hannibal & St. Joseph, will have jurisdiction of the St. Louis, Keokuk & Northwestern from Hannibal to St. Louis; W. H. Bartlett will be moved from Keokuk, Ia., to Burlington and placed in charge of the line between Burlington and Hannibal, and will also have charge of the Chicago, Burlington & Kansas City between Burlington and Carrollton.

San Antonio & Aransas Pass.—F. A. Fulwiler, hitherto Acting General Eastern Agent at New York, has been appointed General Eastern Agent, with office at No. 353 Broadway, New York.

Sebasticoak & Mosshend.—Leonard Hoxie, who has been Maine Central agent at Great Works, Me., for several years, has been appointed Superintendent of this road.

Silver City & Northern.—At the annual meeting of the stockholders of the company, held in the office in New York, the old Board of Directors was re-elected for the ensuing year, and also C. Lawrence Perkins, Presi-

dent; T. G. Taddon, of Colorado Springs, Col., Vice-President and General Manager; and R. P. Perkins, of New York, Secretary and Treasurer. J. B. Gilchrist was appointed Superintendent. The main office of the company is now at Colorado Springs, Col.

Terre Haute, Saylor Springs & Chester.—This company elected the following officers: President, B. F. Scaife; Vice-President, L. W. Barnes; Secretary, A. E. Rhoades; and Treasurer, A. G. Allen.

Union Pacific.—The recent appointments in the general freight department have just been announced officially. Elmer H. Wood, Assistant General Freight Agent, will have charge of the freight traffic of Nebraska, Kansas and Wyoming. C. J. Lane, the new Division Freight Agent, will have immediate supervision of the freight traffic of the Nebraska division. The jurisdiction of S. W. Eccles, Assistant General Freight Agent at Salt Lake City, has been extended to include the local freight traffic of the main line west of Green River, Wyo.

Velasco & Northern.—The company has been chartered by T. J. Allen and Newton B. Childs, of Kansas City, Mo.; H. L. Breneman, of Paris, Texas; J. M. Ford, F. E. Fairbanks, J. H. Fairbanks and H. B. Lincoln, of Denison, Tex.

Velasco Terminal.—J. B. Bartholomew has resigned his position of Assistant General Freight Agent of the International & Great Northern to become General Manager of the Velasco Terminal.

Vermont Valley.—The directors have elected Oscar Edwards, of Northampton, Mass., President, to fill the vacancy caused by the death of A. B. Harris.

Wilmington, Chadbourne & Conaway.—At an adjourned meeting, held at Wilmington, N. C., Feb. 16 the following officers were elected: President, Warren G. Elliott; Vice-President, H. U. Butters, and Directors, H. Walters, W. A. Riach, John F. Divine, W. T. Walters, B. F. Newcomer, H. U. Butters, B. G. Collins, W. H. Butters, J. R. Kenly. At the previous meeting, held a few weeks ago, the other officers were elected as follows: General Manager, J. R. Kenly; General Superintendent, J. F. Divine; Traffic Manager, T. M. Emerson, and Secretary and Treasurer, James F. Po-t, Jr. The road recently came into the control of the Atlantic Coast Line.

Wisconsin Central.—A circular issued last week announces the appointment of W. G. Pearce as Purchasing Agent, in place of C. C. McLeod, assigned to other duties, a change already noticed in these columns.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Akron & Eastern.—The application for a charter for this railroad company has been filed with the Secretary of State at Columbus, O. The new line will extend from Akron through the Mahoning Valley, near or through the towns of Niles, Youngstown, Lowellville and Struthers to New Castle, Pa., where it will connect with the Western New York & Pennsylvania. It will be the eastern connection of the Pittsburgh, Akron & Western road, now in operation to Akron. The survey was made last November for about 71 miles to the Ohio state line.

Anaconda & Bitter Root Valley.—A number of towns interested in the building of this road have begun a movement looking to its construction this year. The company was incorporated last fall by Marcus Day and other owners of the Anaconda Iron Mines. The route will be about 70 miles long, extending from Anaconda southeast to Hamilton in the Bitter Root Valley. It would open up an extensive timber tract at that point, and the Bitter Root Development Co., which owns part of the timber, may aid the line. Corey Bros., of Ogden, Utah, are reported to have the contract for building the road.

Austin & Northwestern.—Ricker, Lee & Co., of Galveston, Tex., the contractors for the extension from Fairland, Tex., have sublet parts of the line to D. Ricker, M. Hurley, P. Bails, J. H. James, Sweeney, Flynn, Corde Bros. and Jordan Bros. Work was commenced Feb. 1 and over 350 teams are now at work on the grading, which has been completed for about 11 miles. It is expected to have the extension finished to Llano by April 1. From the Colorado River to Llano the distance is only 20 miles. The bridge across the Colorado cannot be completed by that time, but trains will be able to cross on false work. Work on the east end of the bridge is progressing very rapidly.

Baltimore & Ohio.—About 15 miles of the Pittsburgh Division, between Pittsburgh and McKeesport, is to be relaid with 65-lb. rails, and other improvements are to be made on the line this summer, including the reduction of several heavy grades. The high trestle on this division near Snowden has been filled in, the reverse curve at Indian Creek has been eliminated and a number of other changes of this nature have recently been made.

Bellingham Bay & Eastern.—Several miles of grading on this road near Puget Sound have been completed and the tracklaying will soon begin. The contractors are A. L. McCoy & Co., of Fairhaven, and they are employing about 200 men. The line now under construction is a standard gauge road six miles long, extending from New Whatcom, Wash., on Bellingham Bay to Lake Whatcom, just south of the British Columbia boundary line. It is proposed to complete the line about June 1 for coal and logging traffic, which will be the principal freight. The company will use temporarily about three miles of an electric railroad now built, this road being operated by locomotives of this company at the same time that it is used by the electric cars of the street railroad.

Birmingham, Sheffield & Tennessee River.—General Manager P. A. Campbell has recently returned from New York and reports that he was unable to complete the financial arrangements for building the proposed extension into Birmingham, Ala., from the present terminus about 40 miles from that city. He expects, however, to be able to do so shortly, and will soon have his plans ready to begin the construction of the line this year.

Blue Ridge.—This company has been granted a charter by the Virginia Legislature to build a road commencing at Jacksonville, Floyd County, and extending in a northerly direction to connect with the Norfolk & Western at Radford, Va. The incorporators are William Smythe, W. Scott, J. B. Hawley, J. W. Williams and Z. T. Dobyns.

Boston & Maine.—The double tracking on the Saugus branch of the Eastern division is nearly completed. The delay at West Everett, Mass., will last six weeks or

more, and then a week's work will complete the railroad.

Buffalo & Geneva.—The track has been laid for a single track between Buffalo and Geneva, N. Y., and a considerable part of the second track has also been laid. This work is now being prosecuted from Buffalo, the Genesee River, Victoria and Geneva, and also on the line between Van Etterville and Sayre. The double track is to be ready May 1, which is the date set for opening the line.

Burlington, Cedar Rapids & Northern.—A survey is being made from Manly Junction west to Forest City, Ia., a distance of 20 miles, and it is reported that it will be continued further west toward Estherville, in the northern part of the state. The construction of the branch will form a connecting link between the main line and the Belmont Division, which extends north to Forest City.

Canadian Pacific.—The General Superintendent of the Western Division is authority for the statement that the construction of several new branch lines of that division has already been decided upon and also a number of other improvements which are to be carried out during the present year.

Charleston, Clendennin & Sutton.—The directors met in Charleston, W. Va., last Saturday and opened the bids for building the first twenty miles of the line from that town, asked for a month ago, but deferred letting the contract one week to allow some of the bidders to modify and extend their bids.

Chicago, Rock Island & Pacific.—The contractors on the extension through Indian Territory have over a thousand men and nearly 500 teams employed in grading the line between Minco and the Red River. The principal contractors are McCormick Bros., J. A. Ware & Son, W. F. Callahan & Co., and Bethune & Crane Bros. Tracklaying will probably be commenced about March 1, and that work may be completed to the Red River by July. The grading is generally very light and the maximum curves are two degrees. The only large bridge is over the Red River, where it will be necessary to construct a bridge 1,000 ft. long, with five spans, each 200 ft. long, together with 2,000 ft. of wooden trestle. The other iron bridge work on the line will include five spans, each about 100 ft. long, over small rivers in the Indian Territory.

Chicago & West Michigan.—The tracklaying on the Petoskey extension north of Bellaire, Mich., is reported to have been suspended for the present. The rails were laid as far as this town last fall, a distance of 36 miles from Traverse City.

Cincinnati, Cincinnati, Chicago & St. Louis.—The engineers are making estimates for a second track on the line between Cincinnati and Indianapolis from a point about 13 miles west of Cincinnati, the present terminus of the double track road, to Lawrenceburg Junction, Ind., a distance of about 25 miles.

Concord & Montreal.—The company has begun to secure the right of way near Manchester, N. H., and through other towns in that vicinity, for a short branch intended to connect the main line south of Concord, near Hooksett, with the Concord & Portsmouth, and which has been located to the north of the town to make a continuous line between Concord and Portsmouth so that it will not be necessary for trains to run into Manchester.

Duluth, Mesabi & Northern.—This road is now asking for propositions for the location, at the head of Lake Superior, of its ore docks, which will be 54 ft. above the water and have a capacity of 1,000,000 tons of ore a year. A large force of men is now at work clearing the right of way. A franchise has been secured to build its track on Fold du Lac avenue, in West Duluth. The contracts for grading the line are being sub-let in five mile sections. The road is to be in operation by Aug. 1.

Duluth, Pierr & Black Hills.—The General Manager states that the grading will be resumed between Aberdeen and Pierre, S. D., as soon as the weather will permit, probably in April. About 50 miles of road remain to be graded between these points, but as the work is very light, it is expected to have it completed in June or early in the summer. As stated last week, it is proposed to lay the track this year on the entire line, and to have it ready for operation by the Northern Pacific before next January.

Florence, Cripple Creek & State Line.—The charter of this company has been filed in Colorado to build a line from Florence to Cripple Creek, Colo., 18 miles, the new mining camp, and to Fremont and the north state line. The surveys have been begun. J. A. McCandless, of Florence, Colo., is General Manager.

Great Northern.—Tracklaying on the Pacific coast extension has reached a point 18 miles west of Kalispel, Mont., where it was stopped on account of the incomplete grade, but will be resumed in about two weeks. The right of way through Spokane has been granted by that town.

Great Northwest Central.—President J. A. Codd, of Ottawa, has written a letter explaining that the objection of the Manitoba & Northwestern to the location of the extension of this line beyond Chater, Man., does not apply to the entire line, as has been implied, but to only 25 miles of the location. He claims that it is necessary on account of engineering difficulties to make a deviation to the north for about 14 miles, and that it is only this section which comes within a distance of eight miles of the Manitoba & Northwestern. He asserts that the latter company has built its road at least 25 miles further to the south than was shown in the surveys approved by the Government, and if for this reason alone, his company should not be prevented from building the line as now surveyed.

Hearne & Brazos Valley.—Work is reported to have been begun by the company in extending its line southward from Mumford, Tex., to Moseley's Ferry on the Big Brazos River, in Brazos County.

Helena & Castle.—W. A. Havens, of Helena, Mont., has secured a contract to survey the route of a railroad from Helena across the Missouri River southeast to the mines at Castle, 115 miles. The contract is with the citizens' committee representing the subscribers to the fund of \$200,000 by citizens of Helena and Castle, to be given to the corporation building the road. A syndicate is reported to have agreed to float the bonds providing the survey demonstrates that the line can be built for \$2,250,000.

Isbell & Iron Mountain.—The contract for completing this line is reported to have been let to T. A. Clark,

who proposes to begin work at once. The road will extend from Isbell, Ala., to iron mines six miles from the town, and was partly graded in 1888.

Kansas City & New Orleans.—Grading on the first 10 miles of this road is to be commenced next month. The company has been organized to build a road 100 miles long from the Choctaw coal fields, in the Indian Territory, across Bowie and Cass counties to Collins' Bluff, on Red River. Forty miles of the route consists of a narrow gauge line, which is to be acquired and made standard gauge.

Little Wabash.—The stockholders of the company will on April 28 issue \$1,500,000 in bonds, to be used in building the line from Effingham to Carmi, Ill., 70 miles.

Lynchburg, Keysville & Atlantic.—A bill has been introduced in the Virginia legislature incorporating the company with John W. Craddock, W. D. Adams, Alexander McDonald and others as incorporators. The company is to build a railroad through Campbell and Charlotte counties, and to deep water.

Mankato & Northeastern.—President P. H. Carney says: "Nearly all of the right of way for 57 miles of the road has been secured and work will be begun as soon as the frost is out of the ground. The object at present is to bring into Mankato those roads not already entering the city and that will not build, and ultimately to extend to Lake Superior. Our line will cross the Minneapolis & St. Louis at Montgomery; the Chicago, Milwaukee & St. Paul at Farmington, and the Chicago, St. Paul & Kansas City at Rich Valley or Pine Bend. The route from Mankato to St. Paul will be 12 miles shorter, either via the St. Paul or the Kansas City road than the shortest line now. The line will be built by the citizens of Mankato." F. D. Woodbury, of Mankato, Minn., is Chief Engineer.

Maryland & Washington.—The charter of the company was filed in Maryland last week. The incorporators are to have authority to construct a single or double track road to run either by steam, electricity or other power, from a point at the northeast boundary line of the District of Columbia to Branchville and Laurel, in Prince George's County. No grade crossings are to be built. The capital stock is \$150,000.

Mexico, Cuernavaca & Pacific.—Gen. Herman Sturm, the President of this road, speaking of the progress of the work, says that nearly 500 men are working near the City of Mexico, chiefly on the belt line around that city. The preliminary surveys have been made for 135 miles from the City of Mexico toward the Pacific Coast. The grades on this section will not exceed 2½ per cent.

Montana Midland.—The Neilhart branch of the Montana Central will probably be extended, under this name, 45 miles to the mines at Castle, Mont., in the Belt Mountains. Surveys have already been made.

Montgomery Terminal.—This company has been organized as the successor of the Montgomery Street & Terminal Co., whose franchises and property in Montgomery were purchased in the interest of the Savannah, Americus & Montgomery to give that road an entrance into Montgomery. The capital stock is \$250,000. The road extends from the present city station and warehouse, on Commerce and Tallapoosa streets, through a portion of the city to the yards and terminus of the Montgomery extension. H. C. Bagley is President, and A. M. Baldwin Treasurer.

Montgomery, Tuscaloosa & Memphis.—Work on the road will be resumed at once, it is reported, and completed to Tuscaloosa, Ala. All but 10 or 12 miles of the grading is completed, work having been suspended several months ago. The road will be 105 miles long, extending northwest from Montgomery through Maplesville to Tuscaloosa, Ala. Dean, Berry & Boehmer, which firm has the contract for building the road, have not yet received instructions to resume work, but hope to have definite orders shortly.

Nampa Railway & Construction Co.—This company has filed articles of incorporation in Idaho. The company has been organized in Nampa, Idaho, by M. A. Kurtz and others, and is to build a narrow-gauge road from Nampa to South Mountain, Owyhee County, Idaho, via Reynolds Creek, and past Silver City and De Lamar, and north to a point near Gold Hill, Boise County, Idaho, via Emmett and Payette. The route chosen for the proposed road is through the agricultural country lying between the Snake and Boise rivers, reaching the mining camps on the south and the timber regions of the Payette. The engineers will make a preliminary survey very soon.

New Roads.—James Campbell, of Los Angeles, President of the Santa Monica Wharf & Terminal Railroad, who has built several lines in southern California, states that he is arranging to build a road from Barstow, Cal., in a northeasterly direction, to the Nevada line, toward Salt Lake City. He will begin a reconnaissance of the line in a few weeks.

New York, Susquehanna & Western.—A survey has been made for a branch from a point just east of Hackensack to Lodi, N. J., about two miles long.

Norfolk, Wilmington & Charleston.—The party of engineers under the charge of F. D. Jones, Assistant Engineer, which has been surveying through the southern part of North Carolina, completed the preliminary surveys last week to Conly, N. C., on the Carolina Central Road, connecting at that point with a survey which has been made north from Charleston, S. C. The preliminary survey is practically completed from Norfolk to Charleston, the engineers being now engaged in revising the location at several points in North Carolina.

Northern Pacific.—There is a likelihood of grading being resumed in a few months on the extension of the Central Washington road, from Coulee City to Waterville, Wash. Trains are now running to Coulee, to which the road was built in 1890.

Ohio & Big Sandy.—Thompson Bros., of Ashland, Ky., are completing 16 miles of work on this road, which includes one tunnel, over 2,000,000 ft. of timber in bridge work, heavy rock work, etc. It was commenced in July last, and the extension will be in operation in March.

Ohio Valley.—About one mile has been graded on the extension now being built from the Clarksville and Princeton branch, recently leased by the Louisville & Nashville, and work is being pushed rapidly. The surveys have been finished to Hopkinsville, ten miles, and the contracts for grading have been let to Hugh Morgan and W. A. Shipper, of Hopkinsville, Ky. Several hundred men are engaged on the work east of

Gracey, Ky., where the new road leaves the present line. The grading is to be completed by April 15, but the line will not be ready for operation for about 60 days later. There are four iron bridges to be built, three 100 ft. long and one 70 ft. long. Bids are now being received for the masonry for all of these bridges. A. P. Sabin, of Louisville, is the Chief Engineer.

Ottawa Valley.—This company is applying to the Dominion parliament for incorporation with power to purchase the portion of the Great Northern west of Lachute, Que., and the Carillon & Grenville road, to build a bridge across the Ottawa River, between Carillon and Grenville, and to build a road to connect the bridge with the railroads on either side of the river.

Oxford Coast Line.—J. T. Pruden has, it is stated, been awarded contract to grade the road from Oxford, N. C., to a point on the Wilmington & Weldon.

Philadelphia & Reading.—It is said that work will probably be commenced this summer on the proposed extension of the Northeast Pennsylvania Division to Easton, Pa. The surveys were made from New Hope north along the Delaware River at the time that the extension to the former town was under construction. It was then found impossible to secure terminal facilities at Easton, but as the company could now run into the Lehigh Valley station at that point it is thought that the project will again be taken up. The line will be about 25 miles long.

Pan American.—The rails are now being received at Victoria, Tex., the northern terminus of the road, and the tracklaying is to be begun at once. The road has been graded for only 10 miles south of that town, but the contractor, David Shaw, is arranging to put a larger force on the work than has been employed through December and January. It is stated that the heaviest grading on the line is between Victoria and the San Antonio River, a distance of 20 miles, the balance of the route being through a level prairie country to the southern terminus at Brownsville, Tex. The length of the line will be 240 miles.

Peninsular of Lower California.—Seventeen miles of the grading on this line in Lower California is completed and track has been laid for four miles. Tracklaying will be recommenced in a few days, and the balance of the road laid as far as constructed. A detention was caused by an embankment across an arm of the sea, the material for which had to be taken from one end so that only a small force could be used. W. Z. Earle, of San Diego, Cal., is Chief Engineer.

Portland & Rumford Falls.—A consolidated mortgage for \$450,000 was authorized at a meeting of the stockholders last week, to provide for the indebtedness of the old Rumford Falls and Buckfield road, and to complete and equip the road to Rumford Falls, Me. The mortgage is for 20 years, bearing five per cent. interest, and the bonds will be issued at once, over \$100,000 of these having already been subscribed to provide for the completion of the Rumford Falls extension. This line was graded for over 10 miles west of the present terminus at Gilbertville last fall, and the track is to be laid this spring and the extension opened by July. The route is 15 miles long, along the Androscoggin River.

Portsmouth, Smithfield & Western.—The bill for the incorporation of this company in Virginia grants authority for the construction of a road beginning at the Elizabeth River in Portsmouth, through the counties of Norfolk, Isle of Wight, Prince George, Surry, Charles City and Henrico to Richmond. The capital stock is \$10,000.

Potomac Valley.—Work is being pushed rapidly on this road, which is an extension of the Western Maryland line. Beside the bridges little remains to be done, but a part of the tracklaying. Of the three span bridges at Kemp's, over the Conococheague, two spans have arrived and one is on the way. The piers have been up for some time and the bridge will be finished in two weeks. From that point to Cherry Run the road is graded. The largest piece of work remaining to be done is the trestling and bridging over Cherry Run, there being an open space of about half a mile. A one span plate girder bridge is to be erected over the Little Conococheague. The main bridge at Cherry Run will consist of five spans, each 140 ft. long. The building of the false work will be one of the slowest jobs to be done on the line. The bridge is a connected truss, and will stand 35 ft. above the water. Work on the approaches was begun last week. As soon as the bridge at Kemp's is done the tracklaying will be continued to the Cherry Run bridge. Everything now indicates that the line will be completed about June.

Quebec & Lake St. John.—Engineers have gone into the field to locate the new branch line which this company intends to build, a branch from Riviere-a-Pierre to La Tuque, Que., on the River St. Maurice, to open up a lumbering district.

Ravenden Springs & North Arkansas.—The locating surveys have been made for this road, which is to be built by the Ravenden Springs Land Co., and the engineers have the estimates about completed. The contract for building the nine miles of road from the connection with the Kansas City, Fort Scott & Memphis line at Ravenden north to Ravenden Springs, in Randolph County, will probably be let in the next few weeks. The grading is light, the maximum curves being about one-half of one per cent., and there is very little rock work. The only bridge construction will be one iron bridge, 100 ft. long. J. B. Duval, of Ravenden Springs, Ark., is Secretary of the company.

Roanoke, Fincastle & Clifton Forge.—About 50 men are now at work between Fincastle and Cloverdale, Va., repairing the grade, which was built last fall, preparatory to beginning tracklaying this spring. Over 11 miles of the roadbed has been graded by the Roanoke & Botetourt Construction Co., leaving less than a mile ungraded to complete the line between these points. The grading on this section has been very heavy, the maximum grade being 1.66 per cent. and the maximum curves 14 degrees. The tracklaying on the graded section will be completed before July 1, and it is then proposed to begin work on the extension of the line south of Cloverdale, where a connection is made with the Shenandoah Valley division of the Norfolk & Western, and to build the line toward Roanoke, or else north to Clifton Forge, Va. C. H. Vines, of Fincastle, Va., is President, and James K. Brown, of Roanoke, is the Chief Engineer.

Rockford Terminal.—The company has filed articles of incorporation at Springfield, Ill. It is proposed to build a road from the city of Rockford to a point on the Elgin, Joliet & Eastern at Aurora, with a belt line surrounding the city of Rockford.

Rome Belt.—T. F. Howell is organizing a company to build the proposed belt railroad.

Savannah, Americus & Montgomery.—The company has secured control of the Montgomery Terminal & Street Railroad Co. in Montgomery, Ala., which gives it good terminal facilities in the city for its Montgomery extension.

Silver Creek & Dunkirk.—Two work trains under the direction of Smith & Nevins are at work on the excavation of the hill at Silver Creek, near Dunkirk, N. Y., on the Lake Shore cut off, but it may be four months before the work is finished. A trestle is being built across the bay and will be filled in.

Southern Pacific.—The relocation of the line east of Benson, Ariz., which was recently begun, may take six months to complete and will cost probably \$500,000. It is stated that it will be necessary to construct eight miles of new railroad on a higher level to avoid the washouts to which the present route is subject.

Surveyors of the company in charge of E. B. Cushing, have commenced the survey of the proposed New Iberia & Vermilion Railroad, to extend from New Iberia west to Abbeville, Ga., 15 miles.

Velasco & Northern.—The company has been organized by Newton B. Childs, of Kansas City, J. M. Ford, of Denison, Tex., and others, and the charter has been filed in Texas to build a road 80 miles in length from the Brazos River, opposite Velasco, to Richmond, Tex.

Virginia Mineral.—This company has been chartered in Virginia to build a road extending from Quantico, Va., on the Potomac River, the northern terminus of the Richmond, Fredericksburg & Potomac, southwest through Fredericksburg to Danville, Va., a distance of nearly 200 miles. H. von Schon, of Fredericksburg, is one of the projectors.

Virginia Roads.—The Harrisburg & Bridgewater, Virginia Mineral, East Hampton Development Co., Berryville & West Virginia, Lynchburg, Keysville & Atlantic, Nottaway, Keysville & Western and the Virginia Land Investment & Railway Companies, have applied to the Legislature for incorporation. Bills incorporating the Roanoke & New Castle Railway & Mining Co., the Atlantic, Staunton & Western, the Chesapeake & West Virginia, the Blue Ridge, and the Richmond & Rappahannock companies have become laws.

West Virginia & Pittsburgh.—About 500 men are now engaged in the grading and tracklaying on the extension to Gauley River. The line is about 40 miles long, extending from the main line at Gauley Junction, a few miles above Sutton, in a southerly direction, along the right bank of Laurel Creek, crossing it twice, near the northern end, and a few miles above the southern terminus at Camden, W. Va. The grading on the line is now nearly completed, and about five miles of track has been laid. The work will now be pushed with the expectation of having it completed by July 1. The names of the principal contractors are as follows: Thomas J. Steers & Co., Parkersburg, W. Va., and M. H. Chapman, P. Dougher, F. H. Blodgett & Co., and P. J. Millett, all of Weston, W. Va.

No changes of location between Clarksburg and Weston have been determined upon, as recently reported. Preliminary lines were run, with a view of reducing the grades.

Wheeling & Connellsville.—The preliminary survey which is now being made to the Connellsville coal region in Western Pennsylvania has been completed as far as Waynesburg, Pa., about 80 miles southwest of Pittsburgh. The route from Wheeling, W. Va., is easterly through Ohio and Marshall Counties to Ackleys, and thence along Ten Mile Creek and through Harveys, Hagersville and Hinton, Pa., and down the valley to Waynesburg.

GENERAL RAILROAD NEWS.

Boston & Maine.—The report of earnings for the half year to Dec. 31 is as follows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$2,328,337	\$2,342,819	D. \$14,482
Oper. expenses.....	5,297,828	5,378,283	D. 80,455
Net earnings.....	\$3,030,509	\$2,964,586	I. 65,923
Other income.....	200,440	211,026	I. 10,586
Total net.....	\$3,230,949	\$3,175,612	I. 55,337
Fixed charges.....	1,938,831	1,936,069	I. 2,762
Balance.....	\$1,322,118	\$1,239,523	I. 82,595

Chattanooga Southern.—John W. Burke, of Jacksonville, Ala., was appointed Receiver of this road last week by the United States Circuit Court at New Orleans. In place of Newman Erb, who was recently appointed by the same court. The change of receivers was made on petition of a number of bondholders. Judge Pardee has ordered that the suit of the Central Trust Co. of New York be consolidated with that of E. Summerfield, upon whose petition the former receiver was appointed. The litigation is to be conducted by the Central Trust Co.

Cincinnati, Jackson & Mackinaw.—The Purchasing Committee has transferred the property of this company to the new corporations organized in Ohio and Michigan, which will be consolidated this week as the Cincinnati & Southern Michigan.

Evansville & Richmond.—A mortgage for \$1,000,000 has been filed upon the road from El Nora, Davies County, to Westport, Decatur County, Ind. The mortgage is in favor of the Farmers' Loan & Trust Co. of New York, and is payable in 40 years with four per cent. interest. This mortgage takes the place of one covering the division of the road west of Seymour to the Manhattan Trust Co. of New York, and one on the division east of Seymour to the Farmers' Loan & Trust Co.

New York, Chicago & St. Louis.—The following statement gives the earnings for the year ending Dec. 31 as follows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$5,171,088	\$5,820,305	I. \$650,783
Oper. expenses.....	1,911,208	1,545,250	I. 365,958
Net earnings.....	\$1,259,880	\$1,275,046	D. \$15,166
Other income.....	12,571	12,772	D. 201
Total income.....	\$1,272,451	\$1,287,818	D. \$15,367
Fixed charges.....	1,015,816	1,005,244	I. 10,572
Balance.....	\$257,005	\$282,574	D. \$25,569
Div.	150,000	175,000	D. 25,000
Surplus.....	\$107,005	\$107,574	I. \$569

International & Great Northern.—The litigation begun over a week ago by the Missouri, Kansas & Texas Railroad Company against Jay Gould to enjoin the reorganization of this company has been settled out of court by the litigants and the Missouri Pacific Railroad. The terms of the settlement are not disclosed.

New York & Middle Coal Field Railroad & Coal Co.—The company was re-chartered in Pennsylvania last week with a capital of \$1,500,000. E. B. Morris and C. Hartsborne, of Philadelphia, and Elisha P. Wilbur, of Bethlehem, being the incorporators.

New York & New England.—An interview with one of the executive officers denies the report that traffic arrangements have been made with the Philadelphia & Reading for a large coal tonnage. It is not true that the company has been selling treasury preferred stock. The new directory will be changed at the annual meeting substantially in the line indicated by the election of Mr. Corbin and Mr. Parsons, and the report that two Reading men will be elected is not true.

Pennsylvania.—Following is the statement of the business of all lines of the company, east of Pittsburgh and Erie for January, 1892, as compared with the same month in 1891: a decrease in gross earnings of \$22,734, an increase in expenses of \$78,993, a decrease in net earnings of \$572,067. All lines west of Pittsburgh and Erie for January, 1892, as compared with the same month in 1891, show an increase in gross earnings of \$184,838, an increase in expenses of \$242,704, a decrease in net earnings of \$57,826.

Philadelphia & Seashore.—This road, extending from Winslow Junction, on the Atlantic City Railroad, to Sea Island City, N. J., was sold at receiver's sale at Camden, N. J., Feb. 23. Lindley M. Garrison, of Camden, bid it in at \$185,000.

Union Pacific.—The following tables give the earnings of the system and of certain of the divisions for December and the year to Dec. 31:

UNION PACIFIC SYSTEM.			
	1891.	1890.	Inc. or dec.
Gross earnings.....	\$3,750,867	\$3,295,912	I. \$454,925
Oper. expenses.....	2,563,065	2,781,378	D. 218,313
Net earnings.....	\$1,187,802	\$514,534	I. 673,268
Mileage.....	8,144	8,075	I. 69
Twelve Months to Dec. 31:			
Gross earnings.....	\$44,006,731	\$41,338,201	I. \$2,668,530
Oper. expenses.....	24,620,938	30,635,927	D. 6,014,989
Net earnings.....	\$19,385,793	\$10,702,274	I. \$8,683,519

UNION PACIFIC SYSTEM.			
	1891.	1890.	Inc. or dec.
Gross earnings.....	\$3,383,203	\$3,196,340	I. \$186,863
Oper. expenses.....	2,501,815	2,680,680	D. 178,865
Net earnings.....	\$1,078,388	\$515,660	I. \$562,728
Mileage.....	7,098	7,569	I. 471
Year to Dec. 31:			
Gross earnings.....	\$17,889,588	\$13,049,248	I. \$4,840,340
Oper. expenses.....	27,688,896	29,343,961	D. 1,655,065
Net earnings.....	\$15,030,691	\$13,705,286	I. \$1,325,405

OREGON RAILWAY & NAVIGATION (RAIL LINES).			
	1891.	1890.	Inc. or dec.
Gross earnings.....	\$398,644	\$485,494	D. 86,850
Oper. expenses.....	364,116	343,557	I. 20,559
Net earnings.....	\$34,528	\$141,937	D. \$107,409
Mileage.....	1,050	1,029	I. 21
Year to Dec. 31:			
Gross earnings.....	\$5,673,172	\$4,954,711	I. \$718,461
Oper. expenses.....	3,816,398	3,936,023	D. 119,635
Net earnings.....	\$1,856,774	\$1,018,686	I. \$838,088

UNION PACIFIC, DENVER & GULF.			
	1891.	1890.	Inc. or dec.
Gross earnings.....	\$443,181	\$504,929	D. \$61,748
Oper. expenses.....	364,552	319,872	I. 44,680
Net earnings.....	\$78,629	\$185,057	D. \$106,428
Mileage.....	1,432	1,411	I. 21
Year to Dec. 31:			
Gross earnings.....	\$5,746,964	\$5,783,135	D. \$36,171
Oper. expenses.....	4,254,472	1,007,083	I. 3,247,389
Net earnings.....	\$1,492,492	\$1,776,052	D. \$283,560

TRAFFIC.

Chicago Traffic Matters.

Chicago, Feb. 24, 1892.
Chairman Finley of the Western Passenger Association has rendered decisions in a number of cases of alleged violation of the Association agreement. A charge against the Rock Island, made by the Burlington, in which the former is charged with doing a brokerage business and with cutting the Omaha-Chicago rate, is dismissed because the witness for the prosecution failed to support the allegations in the complaint. The charge was based on the alleged purchase of a ticket at Omaha for Chicago at the Rock Island ticket office by a party in company with a broker, the ticket being a Jacksonville (Fla.) coupon ticket, from which the ticket agent detached the coupons beyond Chicago, and the purchaser paid the broker \$23 and received a rebate order for \$12, a cut of \$11.75.

In the complaint against the Chicago, St. Paul, Minneapolis & Omaha for accepting a mileage ticket purchased of a broker and presented for passage by the agent, the ticket being in the name of L. E. Mulford and passenger signing "Leo Mulford," a fine of \$11.50 was imposed. The defense was the crowded condition of the train and haste of the conductor, who did not exercise customary vigilance.

In a complaint against the Chicago, St. Paul & Kansas City for the misuse of a mileage ticket from Chicago, Sept. 25, the charge being that the ticket was made out in the name of "A. H. Roake" and signed by "A. H. Roake," and was accepted by the conductor upon the holder signing the coupon "A. H. Roake," a fine of \$11.50 is imposed on the ground that in the exercise of due diligence on the part of the conductor, he should have called for further and more satisfactory identification. The defense was, first, want of jurisdiction on the part of the chairman, and, second, a reasonable compliance with the requirements of the rules of the Association. An appeal has been taken.

Another case against the same company for a similar violation in respect to a mileage ticket from St. Paul to Chicago, which was honored by the conductor upon presentation and affixing of a signature written materially different from the signature on the contract, has also been decided against the defendant and a fine of \$11.50 imposed. An appeal has been taken in this case also, upon the same grounds as in the former case.

In another case against the same company the chairman sustains the defense and dismisses the complaint. This case grew out of a complaint that the Chicago, St. Paul & Kansas City gave rebates to the party which went from St. Paul to Washington D. C., Nov. 18, in the interest of the National Republican Convention. The affidavits submitted by the defendant denied any agreement on the part of any agent of the road, or any payment by any of its agents of the rebate of \$7.65 which was paid to each passenger by a member of the committee; and there not being sufficient evidence to controvert these statements the chairman found that the weight of evidence was in favor of the defendant.

Representatives of lines members of the Western Freight Association are in session this week, continuing the checking of rates in that territory, which has been going on for several weeks. A large number of tariffs are being revised and lined up.

The Chicago & Erie has given notice that, until otherwise advised, it cannot accept shipments of any kind for New England points reached via Newburg and the New York & New England.

Dispatches from Kansas City state that Chairman Smith, of the Trans-Missouri Passenger Association, has issued a circular to connecting lines, to the effect that "the lines in this Association deem it their right and privilege to control the passenger business originating in their own territory, to the extent that such business shall be contracted on tickets or orders of their own issue. Connecting lines which have placed tickets or orders of any form on sale at points in this territory are therefore requested to withdraw the same."

Traffic Notes.

The City of Denver has ordered the imposition of a license tax on ticket brokers of \$200 a year.

The Pullman and the Wagner sleeping cars which have been running through, once a week, between New York and San Francisco, since Jan. 1, have been taken off.

The Soo Line is said to be carrying a large amount of grain for Boston from Minneapolis and points west of there on a tariff which does not specify the roads over which it is effective.

Mr. E. B. Stahlman, Commissioner of the Southern Railway & Steamship Association, is also commissioner of the Southern Passenger Association, having been chosen to that position last week.

It is reported that the Trunk Line Association has agreed to recognize the "outside agents," who control a good deal of the emigrant business from New York westward, and to pay them 10 per cent. commission on tickets to Chicago or the Mississippi River.

The through passenger traffic over the Southern Pacific for the month of January was as follows:

	First Class.	Second Class.	Grand Total.
Eastward.....	1,002	1,936	2,938
Westward.....	5,371	3,696	9,067
Totals.....	6,373	5,632	12,005

The St. Louis & San Francisco has readjusted its freight rates to points in Southwestern Missouri in such a way that Kansas City merchants suddenly find themselves at a marked disadvantage as compared with those shipping from St. Louis. Commissioner Vanlandingham has issued a circular to the Kansas City merchants advising them how they can partially get around the advanced rates.

Individual coal operators in this section who depend upon the Reading to carry their product to market are complaining of scarcity of cars. The individual operators had the same complaint to make in 1891, when the Reading leased the Central of New Jersey. In consequence of the present scarcity of cars several mines on the west side of the Susquehanna River have been compelled to work half time.—Philadelphia Times.

The roads west of Chicago have been for several months "drumming up" business for the Knights Templar Conclave in Denver next August, and now have their arrangements mostly completed. Half rates will be charged and tickets will be on sale from August 4 to 10. Stopovers to the extent of five days each way will be given. Estimates of the attendance and persons attracted to Denver by the Conclave run as high as 100,000. It is said that at least 6,000 actual delegates have already contracted for transportation.

Railroad Commissioner Hamill, of Colorado, has sent to the Assistant General Freight Agent of the Union Pacific a letter, in which, by virtue of the authority vested in him by the Act of April 6, 1885, he orders reductions in the rates on ore from Silver Plume and other points to Denver, and on coal from the northern coal banks to Georgetown and to Silver Plume, and making several other changes in the company's tariff. This action has been threatened for some time and there has been considerable correspondence between the commissioner and the road. The Denver papers say that the road will ignore the order. It is the first of the kind ever issued in Colorado.

The newspapers have been complaining that certain coal mines at Mystic, Ia., have been compelled to shut down because of an increase in freight rates made by the Chicago, Milwaukee & St. Paul and the Iowa Central. The latter road denies responsibility for the increase. Not all the facts are published, but coal rates in general seem to be in a sensitive condition in Iowa. Certain coal operators applied to the State Railroad Commissioners to advance the rates on coal shipments for distances of over 200 miles, the aim evidently being to shut out coal shipped to Iowa cities from mines in Missouri, the rates being made up of the two state rates. The Iowa operators evidently sell most of their coal within a radius of less than 200 miles. But the commissioners refused to make the advance, as they found it impossible to accomplish the desired end on any rational basis of mileage rates, as compared with the rates which they had established for shorter distances.

Interstate Commerce Commission.

The commission has announced its decision of two cases in opinions by Commissioner Knapp. One is the case of William H. Harvey against the Louisville & Nashville, involving the giving of free passes, and the Commission decides that the action of the defendant in granting to the members of the City Council of New Orleans and the clerk of that body, on account of their official places, free transportation as passengers over all or some portion of its interstate lines violates the act to regulate commerce, and is unlawful.

The other case relates to rates on butter in less than carloads from Lincoln, Kan., to Denver, Colo. As the line between these points runs through a sparsely populated country, furnishing comparatively little business, the charge complained of is not held to be unreasonable.

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The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 292,000 cars. This includes (with plain brakes) 200,000 freight cars, which is about 20 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording an opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 140,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.		Grand total.
1881	105		105
1882	1,085		1,190
1883	4,966		6,156
1884	15,051		21,207
1885	10,410		31,617
1886	8,946		40,563
1887	9,281		49,844
1888	27,696		77,540
1889	26,065		103,605
1890	50,502		154,107
1891	39,061		193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

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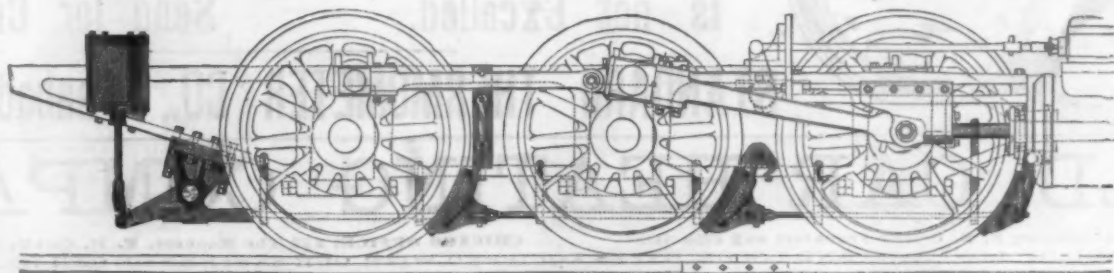
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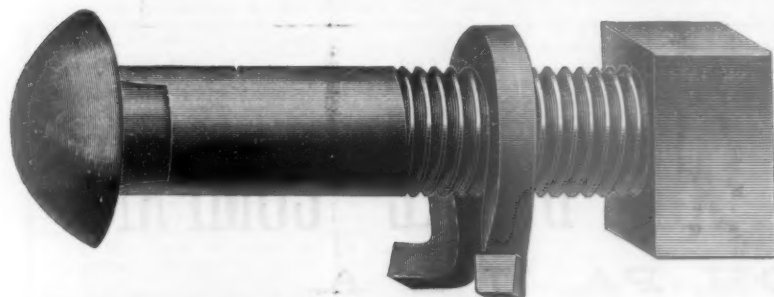
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Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers, furnished to operate with either STEAM, AIR or VACUUM.

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 SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously; rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down thread of bolt.

The nut lock for $\frac{1}{2}$ bolt made of $\frac{1}{4}$ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, i. e., the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in inwardly curved extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

Unlike any permanently placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their dead "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn.; Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

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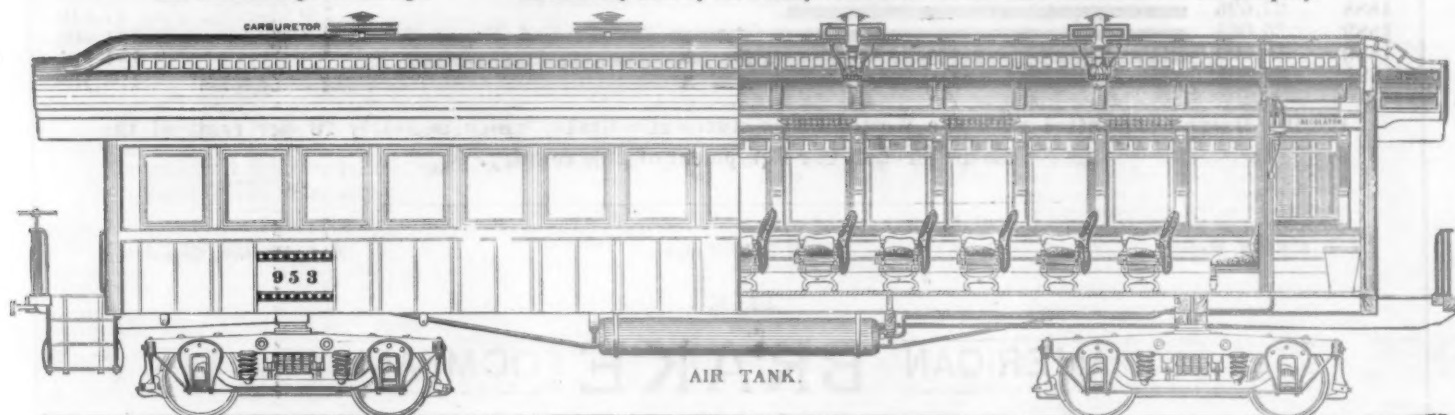
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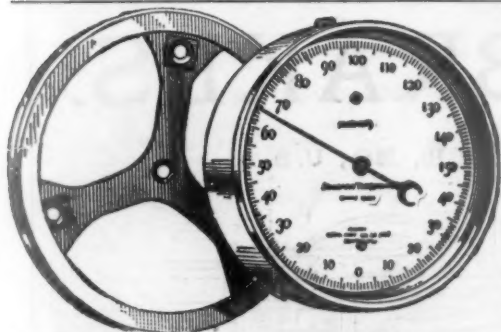


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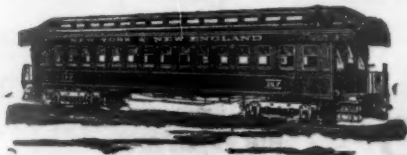
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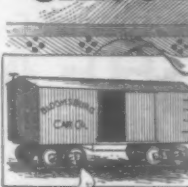
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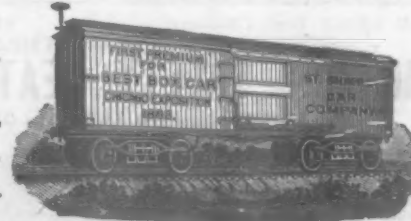
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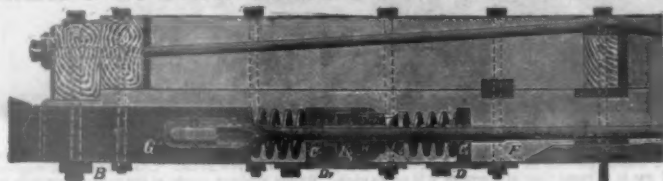
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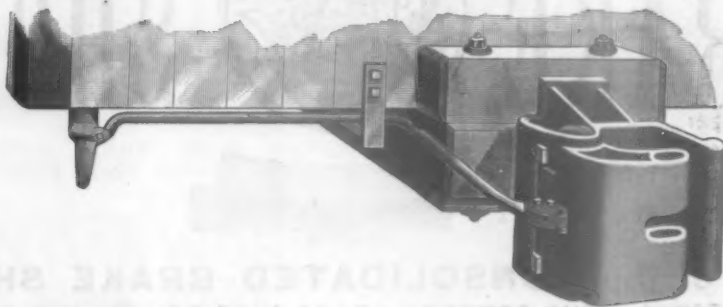
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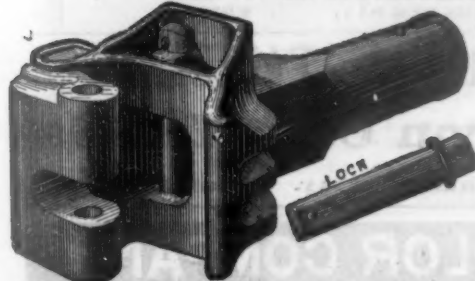


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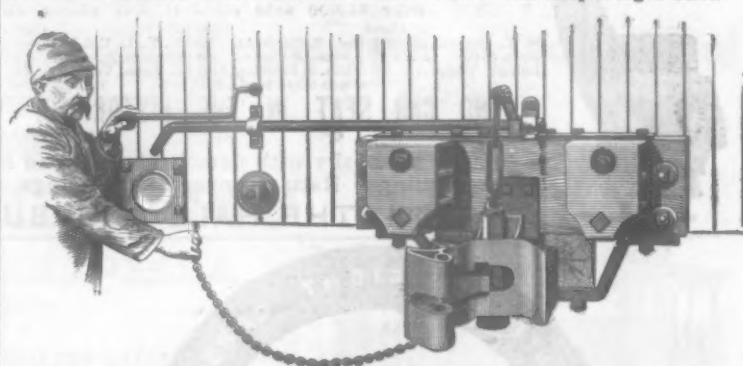
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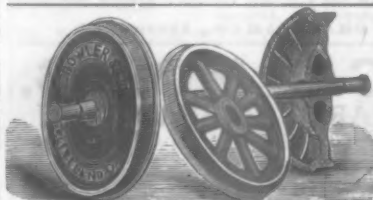
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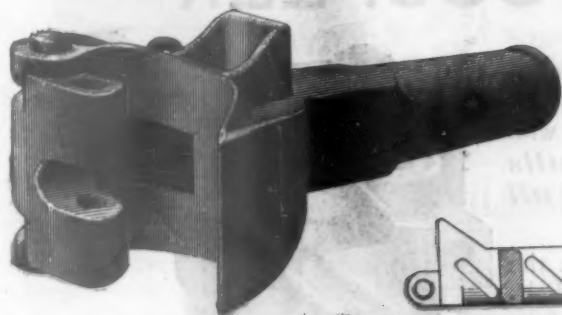
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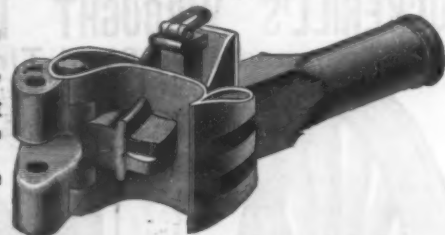
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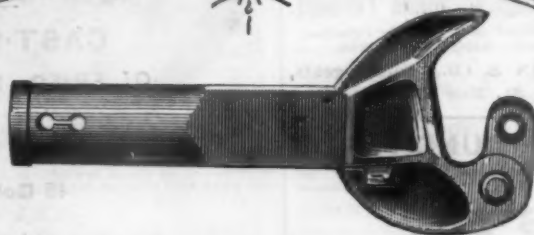
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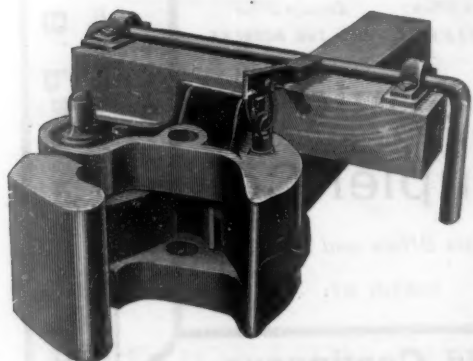
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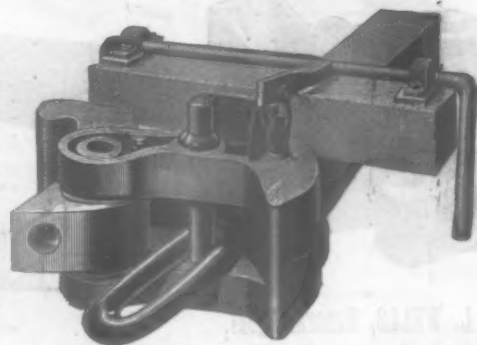
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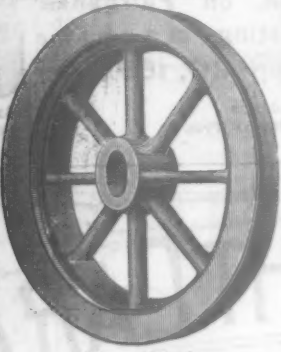
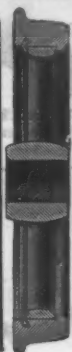
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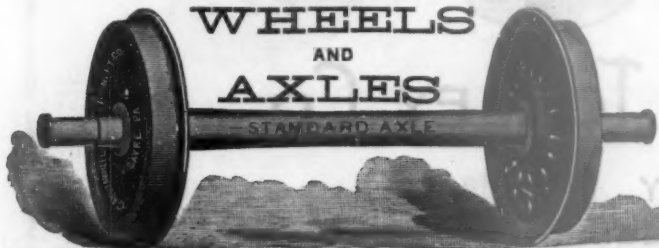
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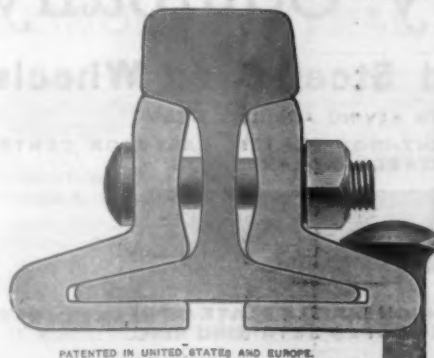
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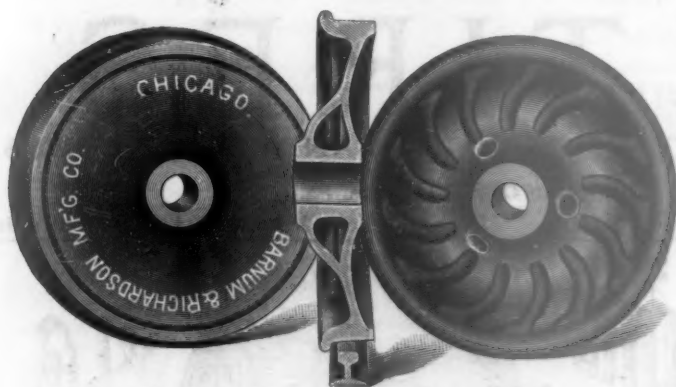
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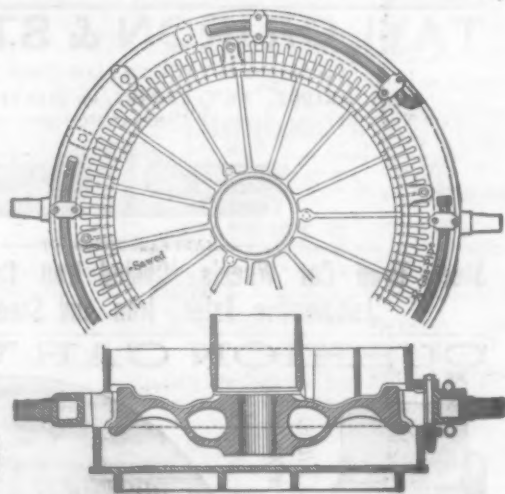
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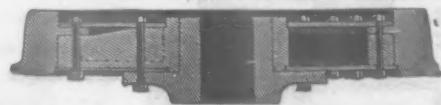
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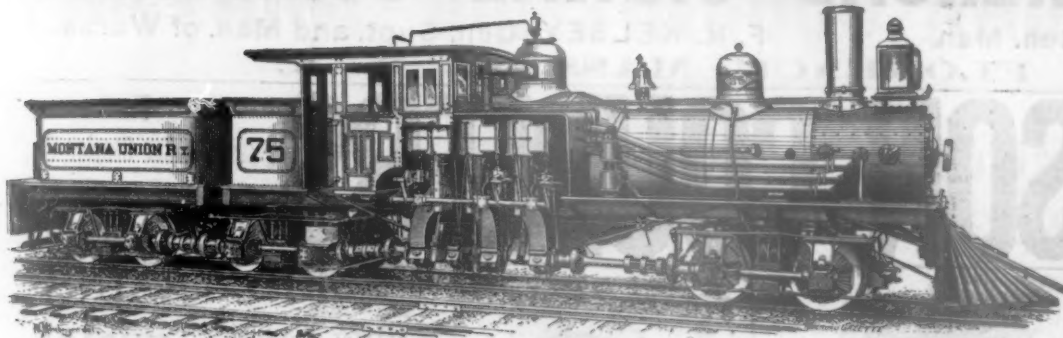
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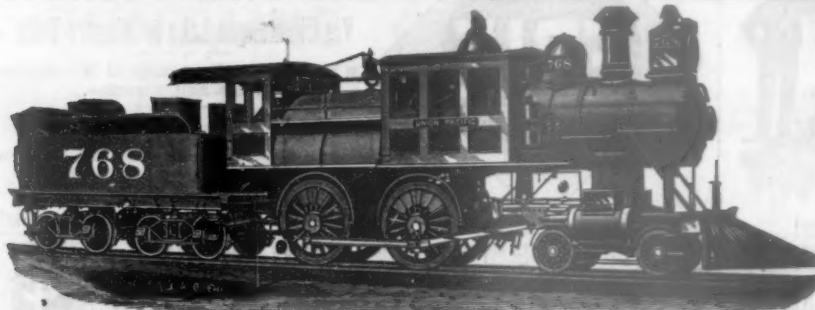
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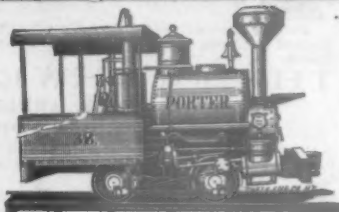
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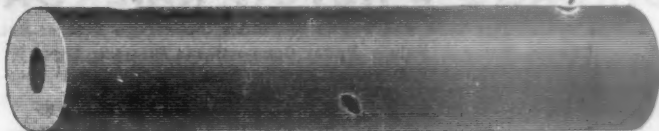
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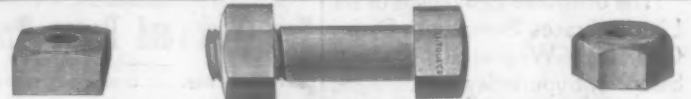
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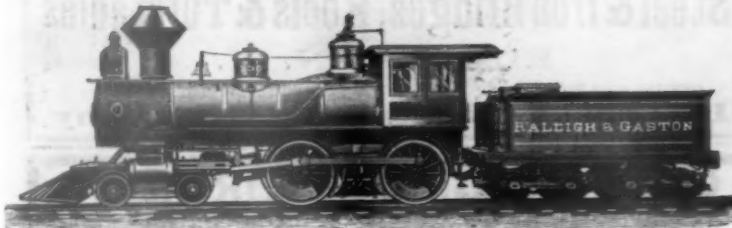
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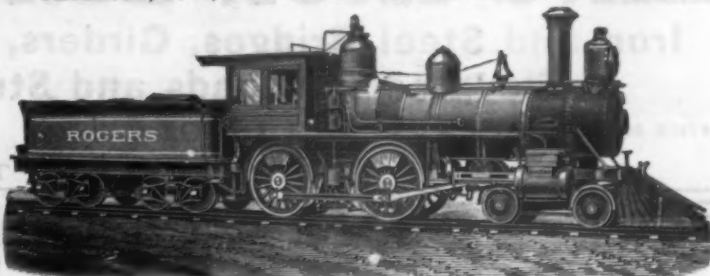
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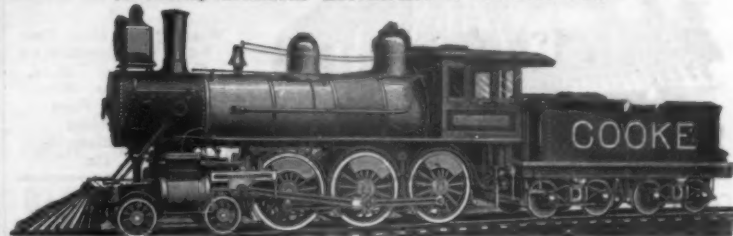
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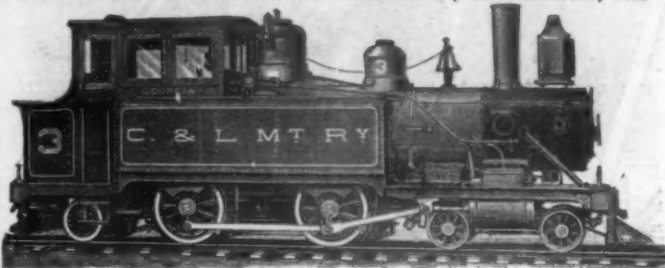
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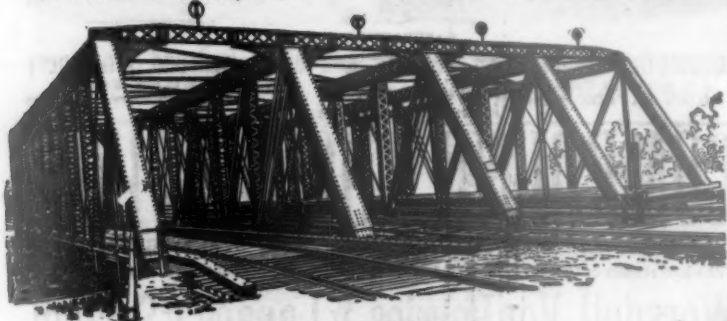
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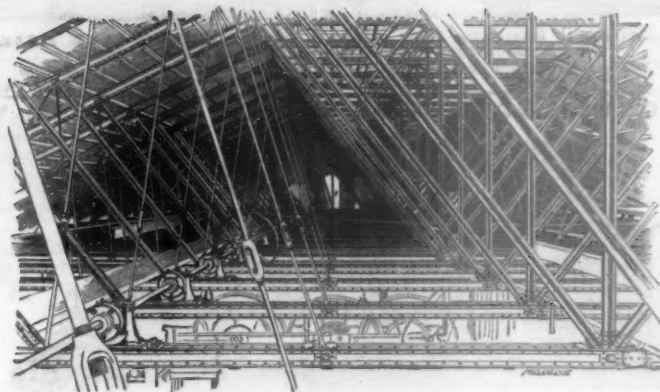
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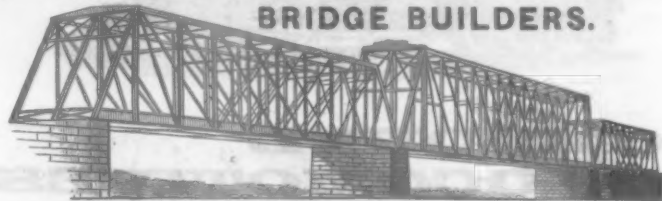
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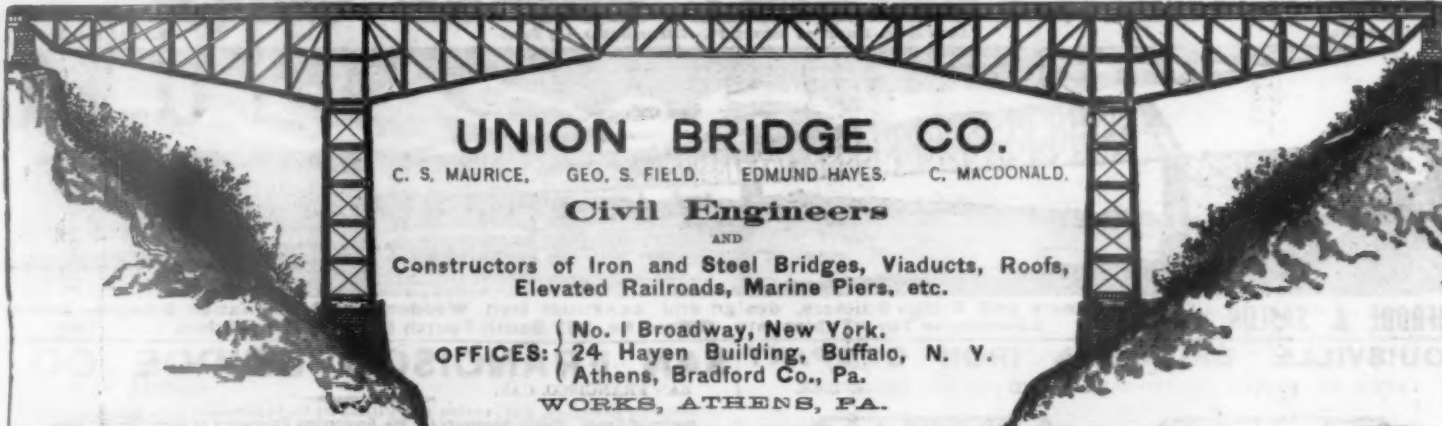
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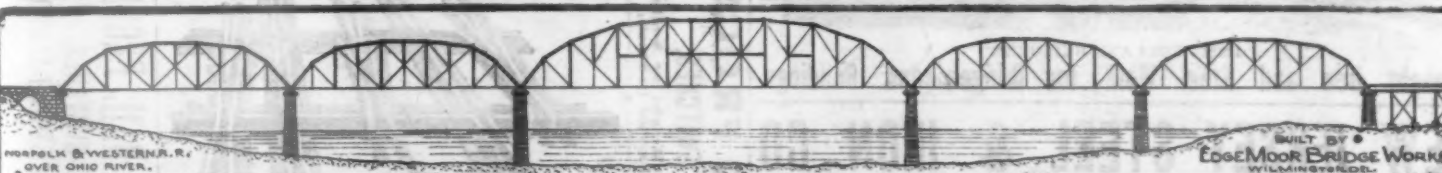
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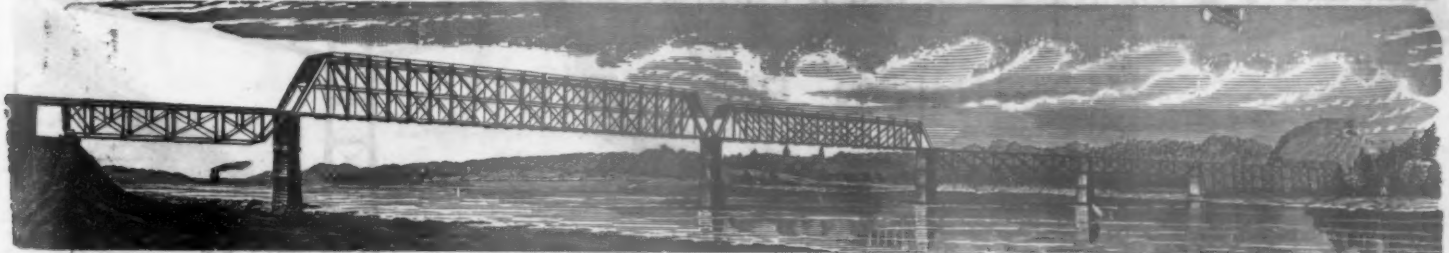
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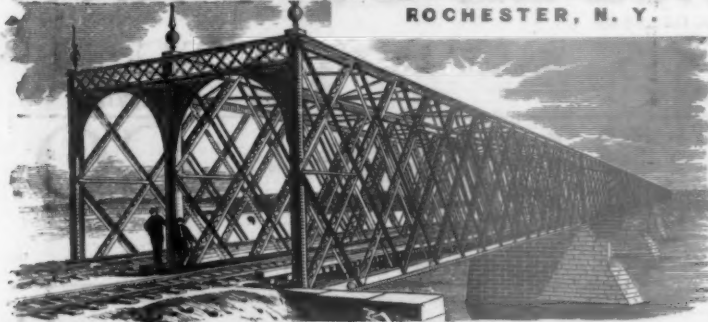
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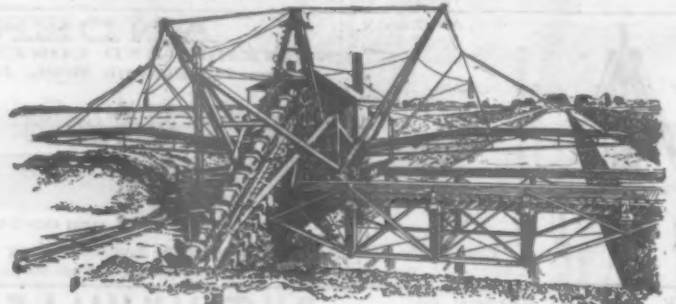
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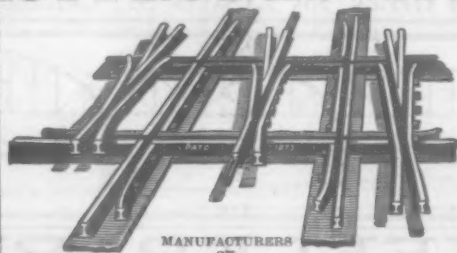
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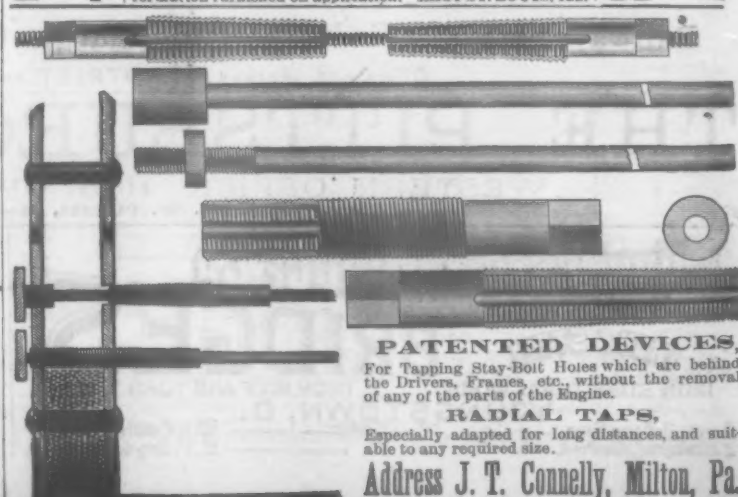
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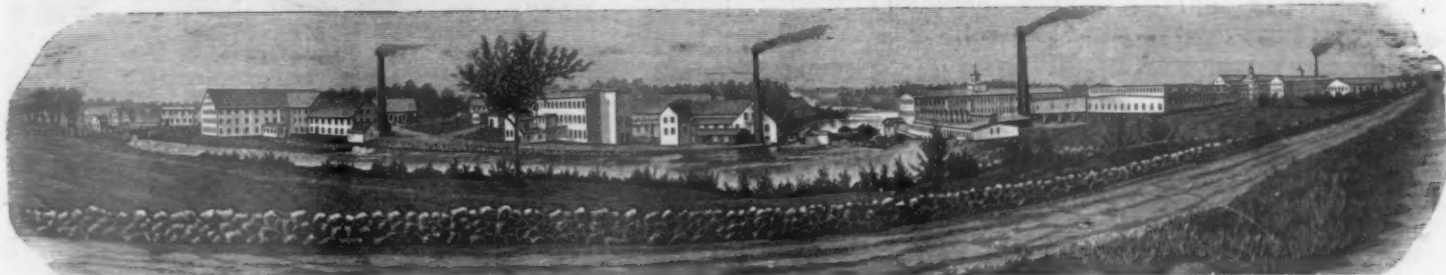
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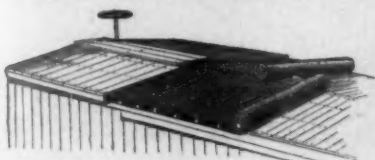
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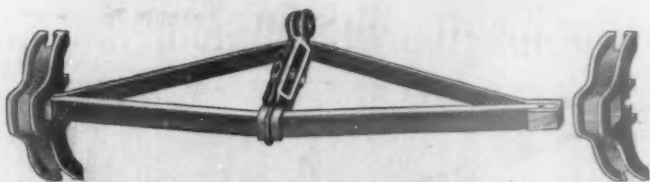
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